This is the Marshall Cavendish Encyclopedia of the Human Mind and Body

Book of Life

In 105 weekly parts–part 2

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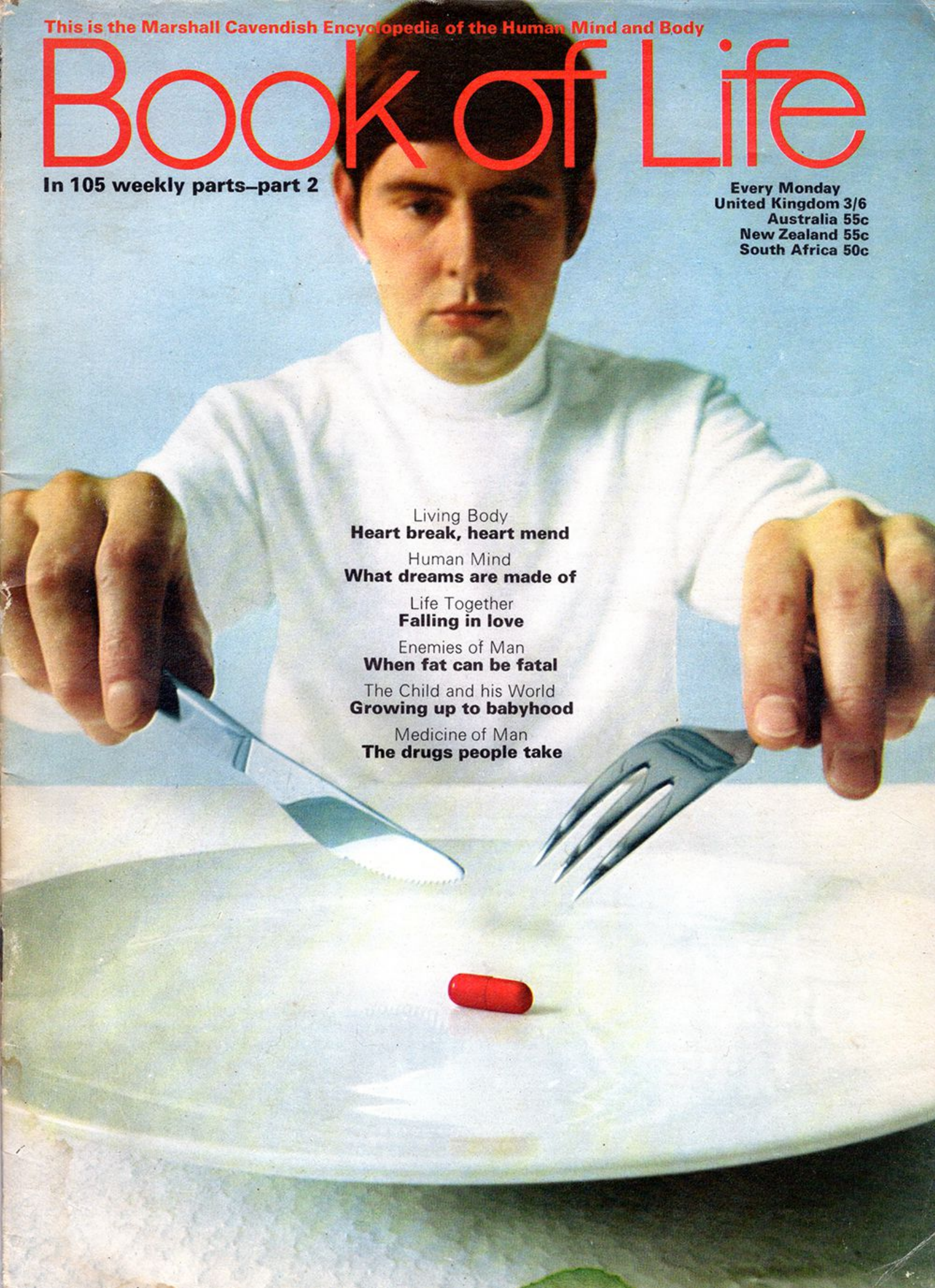

Living Body
Heart break, heart mend

Human Mind
What dreams are made of

Life Together
Falling in love

Enemies of Man
When fat can be fatal

The Child and his World
Growing up to babyhood

Medicine of Man
The drugs people take

Book of Life

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On the cover

Will this be the hearty meal of the future? A favourite science fiction fantasy, this nightmare is one not likely to arrive. But the role that drugs will play in a space age, substituting for more mundane providors of essential vitamins and minerals, is now of active interest to research laboratories throughout the world.
photography by John Banks

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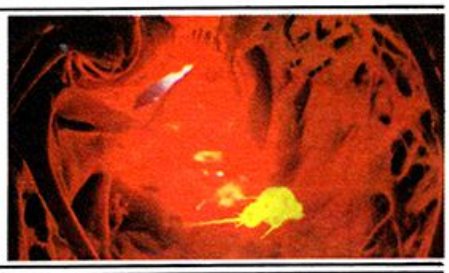

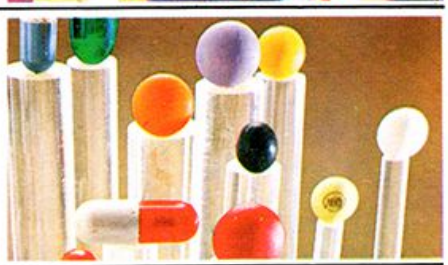

Next week in Book of Life: Do you have personality? Next week, Book of Life discovers. Five more key features cover *The man in love* (What is he looking for? Where does he succeed and fail?) *Survival in the womb* (Does it matter if his mother smokes? Can sex be predicted?) *Making sense of symptoms* (Is it worth bothering the doctor about?) *Hungry world* (What is it like to starve?) *Power of your brain* (What goes on in your brain?)

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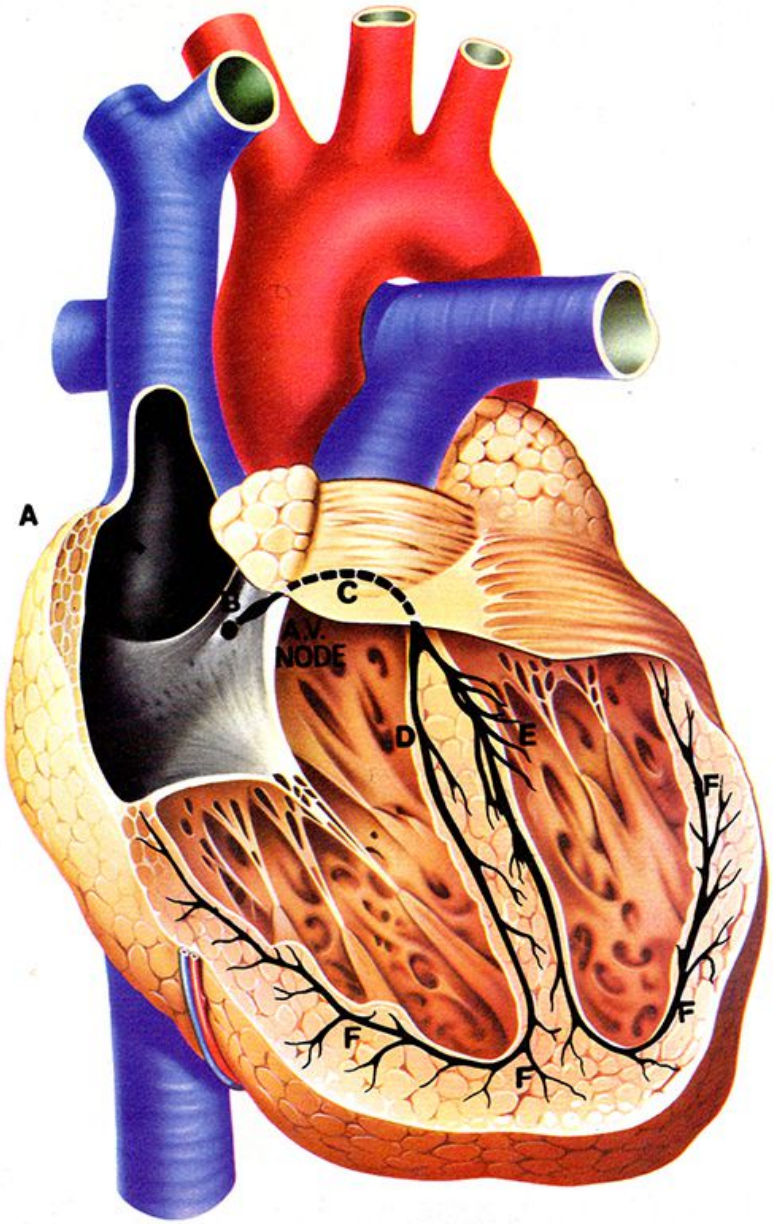


The pacemaker of the heart, A, which governs its rate of beating is made up of a small group of cells sited at the sino-atrial node. Emotion, sleep and physical activity all cause it to discharge impulses at a different speed. The impulses are relayed to the right and left ventricles, D, E, through a bundle of fibres, C, which splits up into many small branches. The whole network has its origin in the auricular-ventricular node, B. Every muscle of both ventricles is supplied with a branch of the network, F, however small. The auricular-ventricular node is the most vulnerable part of the heart. If it is damaged, the ventricles are isolated and can only beat very slowly. The body cannot survive for long under such conditions. If the pacemaker fails, all is not lost. The first artificial pacemakers were worn outside the body and connected to the heart with wires. Recent advances in electronics have made possible the insertion of a new pacemaker under the skin. Yet there still remain many problems, in particular that of control.

Eric Jewell Ass Ltd/Bill Baker

Living Body

Heart break, heart mend

Help for a failing heart is now available. Here is the way medical science gets to grips with the intricate workings and weaknesses of the body's vital pump

IN 1896, Stephen Paget, surgeon and biographer, wrote that 'The surgery of the heart has probably reached the limits set by nature to all surgery'. Paget and his contemporaries would probably be astounded by the calmness with which we accept complex heart surgery today. Yet it is through the work of pioneers that modern heart specialists are able to accomplish intricate and skilful operations, for the surgeon's art is based on a wide knowledge and experience collected over this and other centuries. Apart from surgery, doctors commonly use just two basic methods to look at the heart. One is the simple and ingenious stethoscope which amplifies the sound of the heartbeat, and the other is the intricate electrocardiogram which, through a system of wires and electrical recording devices, traces out a visual record of the electrical impulse generated each time the heart beats. New methods of studying the heart are currently being developed, but as yet they enjoy only restricted application. People have known since ancient times that sounds produced by the heart can be heard if the ear is pressed gently against the chest. Hippocrates used this method, and so did some doctors in the middle ages. But a physician of the early 1800's from Quimper in Brittany, Réné-Théophile-Hyacinthe Laënnec, decided it was an unsatisfactory technique: 'as uncomfortable for the doctor as it was for the patient', he wrote, 'disgust in itself making it impracticable in hospitals. It was hardly suitable where most women were concerned, and, with some the very size of their breasts was a physical obstacle to the employment of this method.'

Laënnec recounted: 'I was consulted in 1816 by a young lady who presented the general symptoms of a heart-disease and with whom the application of the hand and percussion gave poor results owing to stoutness. The age and sex of

the patient forbidding the type of examination of which I have just spoken (direct auscultation). I remembered a well-known phenomenon of acoustics: if the ear is applied to one end of a beam, a pin prick is most distinctly heard at the other end.'

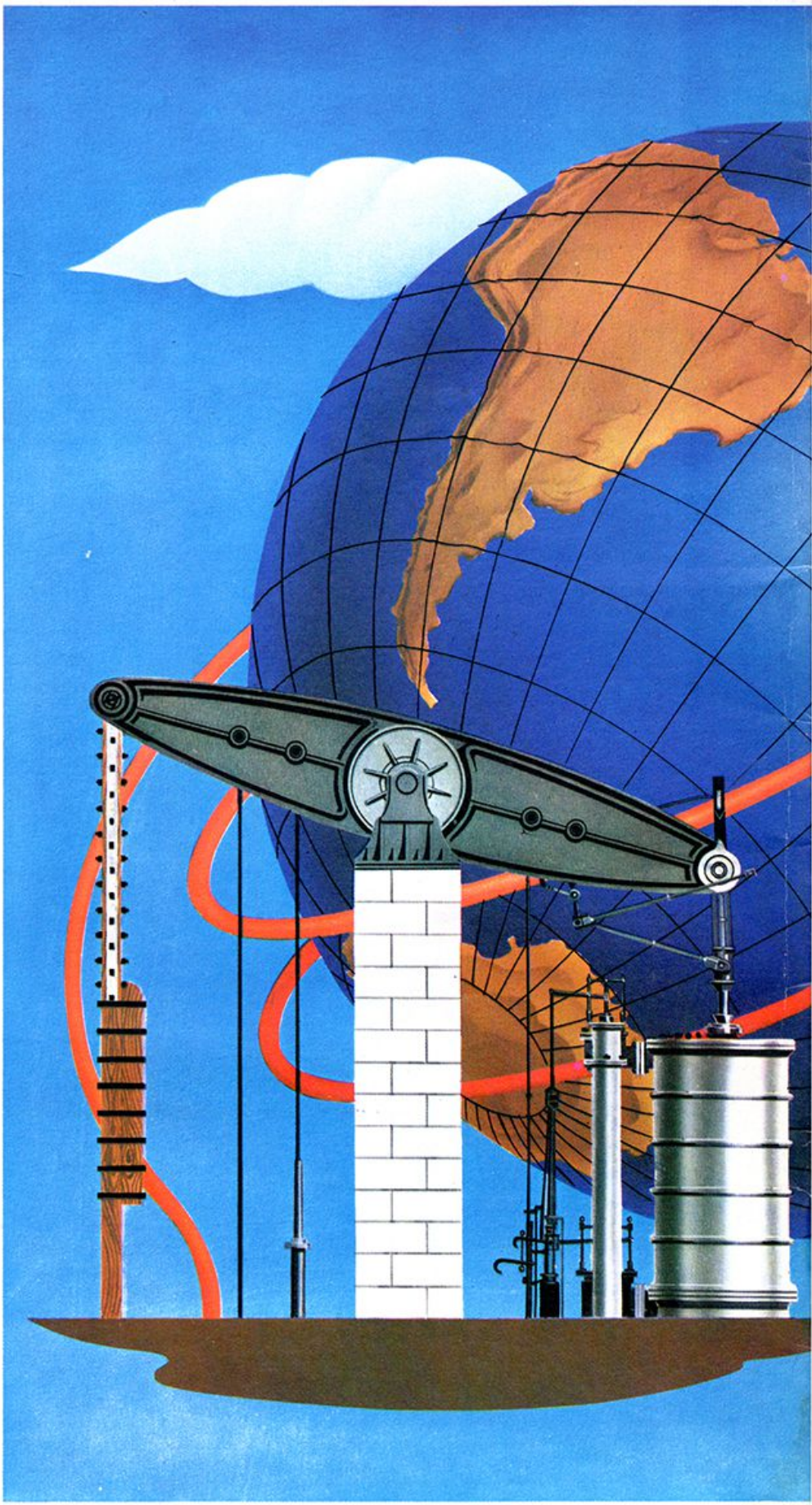
Acting on his inspiration, Laennec took some sheets of paper and rolled them up very tightly. He put the roll to the patient's chest and was delighted 'to hear the beating of the heart much more clearly and distinctly than if I had applied my ear directly to the chest.' He called this method 'mediate auscultation'. Popular legend boasted that the incident which started his train of thought was seeing some boys at play in the gardens of the Louvre in Paris. They had a hollow log, and while one applied his ear to it, the other scratched on its surface.

WHAT material would produce the best instrument for listening to the heartbeat? Laennec tried a whole variety of different alternatives, and even experimented with an oboe. Finally he chose a cylinder of beech wood, about a foot long, pierced through the centre, and with two adjustable parts cupped at the ends. He named his elegant invention the stethoscope. It is an interesting twist of fate that a man whose chief interest was the lungs should invent a device that has been essential in the study and diagnosis of heart disease. Today the trained doctor does not hear just a simple heartbeat through his stethoscope. He uses it to distinguish between the beats of the atria and the ventricles. To him a warning murmur means that perhaps the heart valves are not working properly.

The stimulation which causes the heart to beat is not mechanical but electrical. A sophisticated piece of machinery, the electrocardiogram, is used to record the pattern of this stimulation. Sensitive enough to indicate minute changes in the heartbeat, the electrocardiogram has become a basic tool in diagnosis, research and operation. The contractions of the heart depend on the vital properties of the heart muscle which make it respond to electrical impulses and on highly specialized cells from which these impulses are generated and radiated. Microscopic study on the muscle of the heart has shown that it is made up of a network of branching fibres which connect with one another. Once a contraction starts in any part of this muscle, it does not remain in one place, but spreads to involve the whole network.

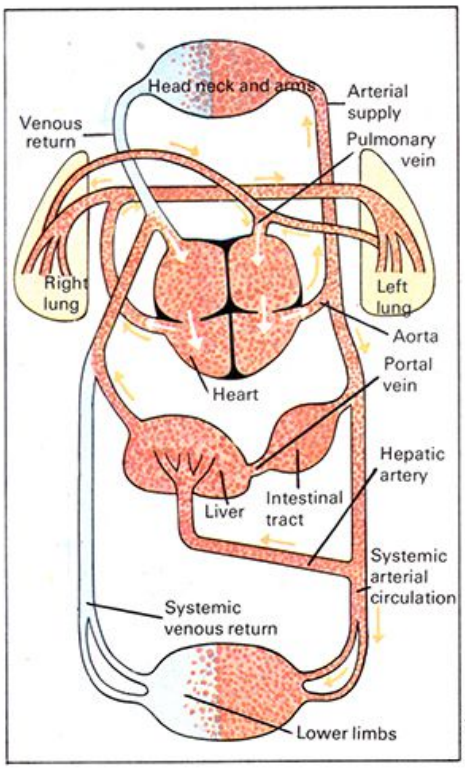
The rate of electrical stimulation and its intensity is governed, for every heartbeat, by a pacemaker. Like a tiny battery, the pacemaker regularly, about 70 times a minute, discharges an electrical current. Then it recharges itself. The tiny group of cells which make up the pacemaker are found in the right atrium of the heart. Because of its positioning it is known as the 'sino-atrial node'.

The electrical impulse from the pacemaker radiates over the walls of the



The heart's spectacular powers as a pump add up to a lifetime of incredible statistics. Its task is to keep supplied the body's 60,000 miles of arteries, veins and capillaries – a mileage that circles the world two and a half times. In a lifetime the amount of blood pumped would fill a vat of 73 million gallons capacity. It is in the lungs that the blood, exhausted of oxygen after its

Hargrave Hands



Manchipp

A double pump, the design of the heart ensures that oxygenated and used blood are kept apart. Blood flows at different rates through the various parts of the body. It goes four times as fast through the kidneys as through the brain.

journey round the tissues, gives up carbon dioxide – the body's waste material – in exchange for more oxygen. Then it passes back to the pump – a machine not made of stone or steel or accessible for constant mechanical repair but a bundle of living cells, weighing only three pounds, and small enough to hold in the palm of the hand. Every day the heart pumps 100,000 times.

atria. As a direct result, the atria contract. Then the impulse reaches another vital point, the auricular-ventricular node – a group of cells situated, as its name suggests, between the right atrium and right ventricle. The auricular-ventricular node triggers the transmission of the impulse to the ventricles. Bands of conducting fibre, made up of highly specialized cells branch out from the node to the left and the right ventricles, and divide and sub-divide to cover the entire inner surface of the ventricle walls. In less than a tenth of a second the impulse spreads all over the ventricles and causes them to contract. Should the pacemaker fail, however, the heart need not do so. Every part of the impulse-conducting system can, in an emergency situation, produce its own rhythmical impulses. These emergency signals are strong near the pacemaker, but get weaker and slower further away from it.

Step by step investigation of the heart's electrical activity was first developed in Holland in 1906. William Einthoven, a physiologist, discovered that by attaching electrical recording devices to the body surface, the electrical impulse of the heartbeat could be monitored. This sort of recording is called an electrocardiograph (ECG). The size of the electric current is minute – only about one thousandth of a volt – and this is a measure of the equipment sensitivity. The basis of the machine is a galvanometer which translates, magnifies and finally draws on paper the electrical changes of each beat. In 1924, Einthoven was awarded the Nobel Prize for this

Inside the human heart, the body's pump is richly supplied with muscles. The power of the cardiac muscles to contract spontaneously ensures that blood circulates all round the body once every 23 seconds. Muscles carpet the ventricles, and bands of muscle link the ventricles to the heart valves. The whole is supported by twisting, muscular pillars. The mitral valve, top right, controls the entry of blood from the lungs. Below it is the aperture of the aorta, the artery taking blood to every corner of the body.

important contribution to medical research.

In the laboratory, electrical contact with the body is made by sticking metal plates to the skin at the wrist and ankle with a special jelly. The jelly ensures maximum transmission. Next an electrical recording plate – an electrode – is placed on the chest wall. Instantly the recording device on the galvanometer starts to move. As the paper passes slowly under the moving pen a distinct pattern is traced out for every heartbeat. First comes a small hump – the impulse leaves the pacemaker and passes over the atria. Then comes a sharp upward peak – the ventricles contract. Lastly another small bump is traced out – the ventricles are recharged and ready for the next beat. The patient feels no sensation during the recording, but from it the doctor can detect any upset in the rate, rhythm or nature of the heartbeat and take immediate action.

The picture traced out by the electrocardiogram is of great importance in

Lennart Nilsson

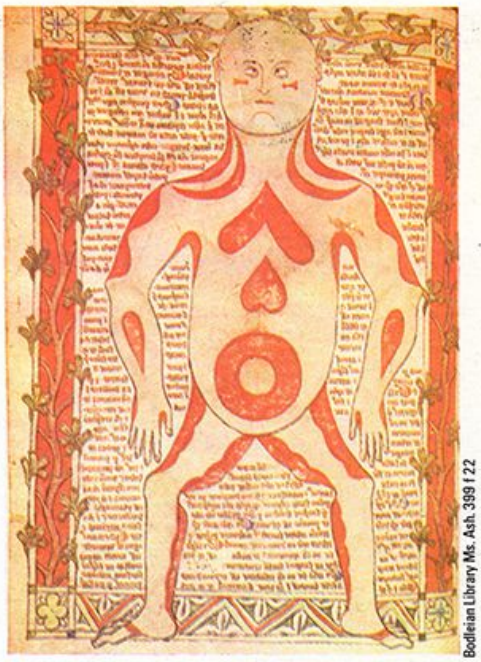
treating victims of accidents, heart disease or coronary thrombosis. The heart may have stopped beating, but the electrocardiogram will show if it is still generating impulses. Should some of these impulses remain, there may be a chance of survival. In hospitals, rapid decisions are often taken, based on the condition of the patient, the reason for cardiac arrest, and the likelihood of a good recovery, to go ahead with resuscitation by artificial methods. In former times when the heart stopped beating this combined with the cessation of respiration – was a sign of death. Today, a life-or-death decision may be aided by a single ECG recording. Once a decision *has* been made, speed is the essence, and artificial restoration of the heartbeat must be attempted within three minutes.

An emergency or crash call brings physicians, anaesthetists and equipment speedily to the bedside of the unconscious patient, while any available staff start external cardiac massage and mouth-to-mouth breathing. The mechanism which makes the heart muscles beat spontaneously is sensitive to mechanical stimulation. The heart may start beating again if it is vigorously massaged. Massage of the heart is performed by placing the base of the hand on the lower part of the breast bone and pressing forcefully directly backwards, one and a half to two inches, 60 to 80 times a minute. An alternative method that can be used under certain conditions, such as immediately after chest surgery, is to open the chest and carry on internal cardiac massage, squeezing the heart itself in the hand.

IT is vital, too, that appropriate drugs are administered, depending on the type of cardiac arrest which has occurred. Adrenalin, a drug which produces an increase in heart rate, can be injected directly into the heart cavity, either through the chest wall or into the exposed heart. This improves the mechanical resistance of the heart muscle, and may even initiate spontaneous muscle contraction if the massage and artificial respiration are proving effective. Here the electrocardiogram record is important as it helps to determine exactly the sort of heart activity that remains.

If a weak heartbeat resumes, chemicals such as calcium chloride or calcium gluconate may be given. Both these help to stimulate the heart into action. The chemical balance of the blood must also be kept at the optimum for strong heart action, and this is commonly done by injecting sodium bicarbonate solution into the veins. Should the heart fibrillate – just quiver – then it can be shocked back into normality. Bursts of electric current are given by electrodes placed either on the chest wall or directly on the exposed heart.

If any of these methods prove successful in resuming normal heart rhythm, intensive care and monitoring of heart action must be provided for some days, so that any change can be immediately detected and acted on to save the patient's life. In special cases of pacemaker failure, artificial pacemakers, which stimulate the heart to beat at a predetermined rate can be used. These have only been used successfully in the last decade, but the concept on which they are based dates back 300 years. The tiny pulse-generator unit, driven by batteries, can be implanted in a pouch under the abdominal wall or in the fold of skin in front of the armpit. Electric leads run into the left side of the thorax, through



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Traditional in shape, the heart was included in a 13th-century medical manuscript to show the position of the body muscles. Physiologists have shown that heart muscle is very sensitive. It will fail in seven seconds without oxygen.

the covering of the heart, and are finally implanted within the ventricular wall.

The fantastic development of cardiac surgery over the last 30 years has depended as much on patient and determined laboratory work as on the spectacular, headline-hitting ability of surgical teams. Public awe and hope have been maintained by extensive news and television coverage of the latest developments, and there seems no limit to the possibilities of correcting the previously untreatable defects of the heart. Our whole concept of what is feasible in the sphere of heart surgery has changed. Delicate operations like repairing congenital 'holes in the heart' – gaps in the wall dividing the ventricles – for example have become accepted as part of our everyday lives. The variety and inventiveness of successful cardiac surgery continues to increase. The development of new plastics has made possible the replacement of diseased heart valves, and surgical skill has made these valves replaceable by human ones. Tumours of the heart have been removed, and even cases of coronary heart disease have been treated surgically.

On January 2nd 1968, Christian Barnard in South Africa, successfully transplanted a human heart into a dentist, Philip Blaiberg. Since then transplants have been made in other countries. The international press has highlighted these operations and all their surrounding problems, medical and ethical.

Cardiac surgery still has the ability to stun and inspire us. Since the days when men believed the heart to be the seat of the soul, of intelligence, of emotion, we have never really ceased to attach to it a special, vital interest.

What dreams are made of

The techniques of modern science have been applied with great success to the phenomena of sleeping and dreaming. An eminent researcher in this field explains what happens when the conscious mind is at rest

A dream, a departure from the world of reality, is a fragmentary experience of the world of fantasy. Dreams take us to other places and other times. They transport us through space and time, not according to the rules of physics, but according to the rules of magic.

The results obtained from clinical observation present a fascinating but incomplete study of the phenomena of sleep and dreams. It is still not known why we sleep at all, why we dream, and what dreams really are.

In the book of Genesis Joseph tells his older brothers of his dream: "'We were binding sheaves in the field, and lo, my sheaf arose, and also stood upright; and, behold, your sheaves stood round about, and made obeisance to my sheaf'. And his brethren said to him, 'Shalt thou indeed reign over us? Or shalt thou indeed have dominion over us?' And they hated him yet the more for his dreams.'"

For the writer of the book of Genesis, the dream was prophetic, but Joseph's brothers, strangely in accord with modern psychological thinking, understood that the bowing-down of their sheaves represented their subordination to him. They recognized in him an ambitious boy who resented his youth and unimportance who was indulging in fantasies of power.

Today most psychologists agree that dreams are symbolic – not prophetic – that they represent persons, places, and things which are significant in the problems and emotional conflicts of waking life. Since the representations are a product of the individual's own mind, the forms they take are conditioned by his background and personality. The interpretation of dreams was a source of considerable controversy among the early psychologists. Sigmund Freud, the founder of psychoanalysis, thought that dreams could be symbols of unresolved conflicts in the individual's mind, and in interpreting specific dreams he tended to stress what he saw as strong sexual overtones. Freud's work on dreams was extremely important but it has since been challenged by many other researchers. Freud's one-time colleague Carl Jung was one of those who provided a quite different theory. He argued that a dream is in itself meaningful and not necessarily a 'cover' for hidden wishes or conflicts. The dream researcher, Calvin Hall, pointed out that a cow may symbolize for one man a gentle, providing mother, but for another man, frightened of animals, it may symbolize all his irrational fears.

Since, however, we share common customs, values, and speech habits, we share common attitudes to many objects which can serve as common symbols. Symbols for sexual organs and activity are frequent in adult dreams and the same symbols are found repeatedly among different individuals, just as frequently as some speech habits. Jung developed a theory of the 'collective unconscious' by which he meant that certain dream symbols were transmitted from generation to generation by genetic inheritance. These symbols were universal to men of all races, and Jung gave them the name 'archetypes' since they were concerned with the basic elements of human existence – birth, death, hunger and so on. There is, however, no support for this theory among present day scientists who believe that dream symbols, like word symbols, are learned and not directly inherited.

We do not have to be able to see in our waking life in order to dream. Recently when I woke from sleep a man who had been blind from birth, he said he had been dreaming. In his dream he had been walking along a corridor with a bare wooden floor. He had not *seen* it because he had no conception of what seeing was like, but he knew that the floor was bare because he could hear the sound of his footsteps and feel the firmness of the tread. When he was awakened at three o'clock in the morning, it was not done on the off-chance that at that time he might be dreaming. I was confident he was dreaming because the traces of his electrical brain waves, which were being recorded on an electroencephalogram machine indicated that he was in a dream state. In sleep, brain waves have a pattern quite different from those of wakefulness. For about an hour the waves are big and slow – the eyeballs remain motionless. Then there is a sudden change into a *different kind of sleep* with different kinds of brain waves. Most of the body's muscles go limp, and the brain becomes more active. The internal temperature of the brain rises, the blood flows through it faster, the heart beats with sudden quickenings, the eyeballs jerk rapidly. In the male, the penis becomes erect.

IT is at these times that if a sleeping man is wakened and asked if he has just been dreaming, he will nearly always answer, 'Yes', and give a detailed account of a dream. These 'rapid eye movement' or 'paradoxical' periods of sleep recur every night. It is now realized that dreaming occurs at least five times nightly for a total of some two hours, and that it is broken up into periods of around 20 minutes each, separated by 60-90 minute intervals.

The discovery of rapid eye movement or R.E.M. periods while dreaming was made in Chicago in the early 1950s. Since then many older ideas have been

1 Frank Habicht

2 British Museum Photo/R. B. Fleming

4 In the Book of Genesis it is said that 'Jacob dreamed and behold a ladder set up on the earth, and the top of it reached to heaven: and behold the angels of God ascending and descending on it'. Ancient peoples believed that dream visions were divinely inspired messages.

Udine Palazzo Arcivescovile Photo/Scala

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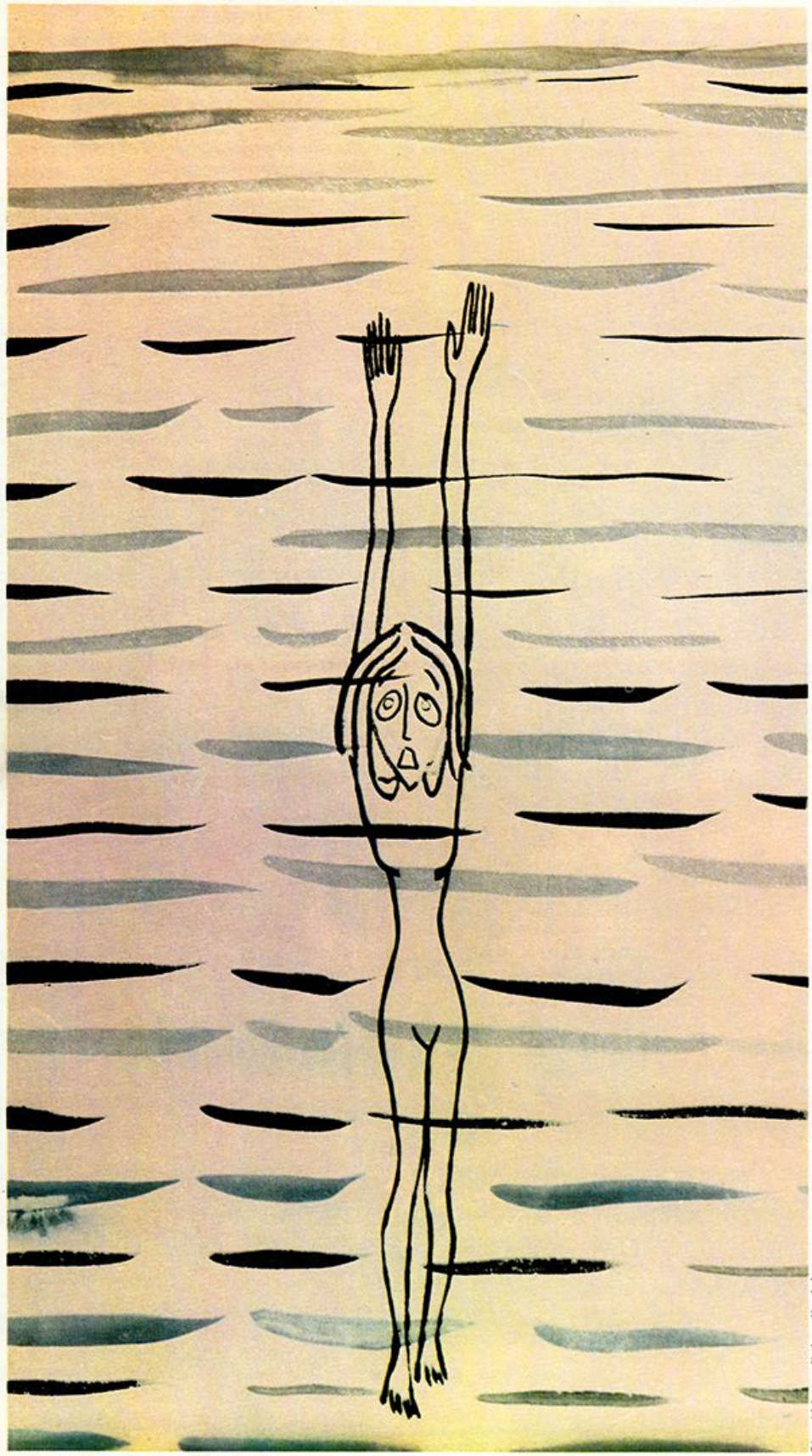
The strange visions that fill the dreamer's world have often formed the stuff of art. 1 Bizarre and erotic fantasies expressive of wish fulfilment have been interpreted into 'dream sequences' by film-makers. 2 *Queen Katherine's Dream,* by the 18th century poet, artist and mystic William Blake exemplifies the ancient belief in the symbolic, often prophetic nature of dreams. 3 *The Dream* of Marc Chagall presents a different aspect – the humorous and whimsical images that appear in sleep.



Edward Adamson, Netherne Hospital

Themes which consistently appear in dreams are often regarded by psychiatrists as disguised and symbolic projections of the unconscious mind. A recurring dream is depicted by a mental patient in her painting: she is naked, drowning, and unable to save herself. Through such representations the motives and conflicts suppressed in conscious life can be analysed.

questioned. It is no longer believed that long dreams can occur in a flash of time, 'nor that dreams take place in 'black and white'. When people are actually wakened from their dreams, the world they describe contains objects of all colours.

Many people say that they never dream. Psychoanalysts used to attribute this to repression, the action of a strict conscience working to prevent recall of dreams which were assumed to betray disreputable yearnings. It now seems that everyone does an enormous amount of dreaming, but that it is almost all forgotten. The amount of dreaming which can be recalled depends merely upon the time at which the recall is attempted. Experiments have shown that any kind of memories formed in sleep are very weak and fade away rapidly.

OTHER people may not forget, but will have a personal notion of a dream as something necessarily bizarre. If wakened from rapid eye movement sleep, such a person might say, 'I was thinking I was riding in a car, a policeman held us up and just then a lorry came . . .'. Manifestly he was not in a car, he was in bed, but he calls it 'thinking' because it did not seem irrational. He was, however, in an unreal world which may be called a dream.

The domestic cat or dog, lying limply asleep on its side, may frequently twitch its tail, paws and whiskers, and, in the case of a dog, emit short growls, while his eyes jerk spasmodically. 'That dog's dreaming', we say. Of course, he can never tell us if he dreams, but to most of us the inference is compelling. Newborn babies spend a great deal of their sleep in the rapid eye movement phase, premature babies even more. They cannot be expected to have any concepts or memories which could allow the construction of dream adventures. Dreaming develops in the course of maturation; full consciousness of the world around him must be delayed while the infant learns to distinguish one type of object from another and to determine the significance of each. While, therefore, dreaming may be specially associated with rapid eye movement sleep, the one is not confined to the other.

When the relationship between the rapid eye movement phase of sleep and dreaming was first discovered it was believed that the two always occurred simultaneously. Yet it had long been realized that dreams could take place at the very onset of sleep, at a time when the rapid eye movement phase of sleep never appears. Newer research has made it plain that at probably no time during sleep is the mind totally blank. When wakened from rapid eye movement sleep, dreams will almost always be recallable. When wakened from non-rapid eye movement, or orthodox, sleep only dull thoughts of day-time problems and events are usually described, but on occasion the thoughts can be quite vivid and colourful and merit the term 'dream'.

At the time when dreaming was thought to be restricted to rapid eye movement periods, an American medical man, Dr. W. Dement carried out his famous 'dream deprivation' experiments. The technique rested on the fact that when we pass from wakefulness to sleep we never pass directly into a rapid eye movement phase. In the course of a series of successive nights, Dement therefore would wake each volunteer whenever, and as soon as, the electroencephalograph indicated a transi-

tion into rapid eye movement sleep, keep him awake for a few minutes and then let him fall asleep again – the volunteer always returned into orthodox sleep, and never into rapid eye movement sleep, as the latter can never immediately follow wakefulness. Hence the volunteer had sufficient sleep, but was prevented from getting rapid eye movement sleep. After several nights it seemed as if a pressure for rapid eye movement sleep had been built up, for more and more frequent awakenings were necessary. When finally a night of undisturbed sleep was permitted, rapid eye movement sleep occurred quickly and occupied more of the night than normal.

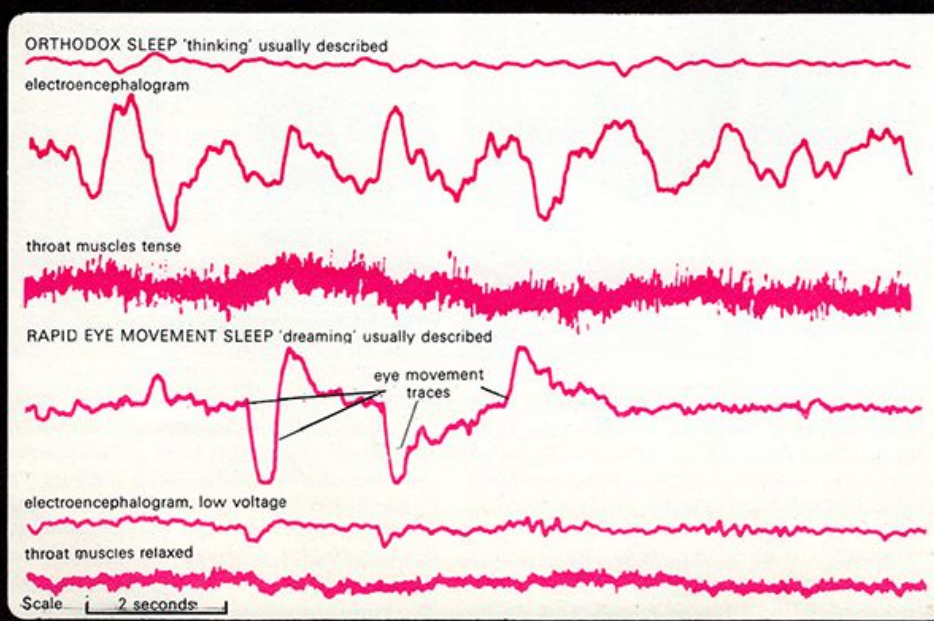
IT was then suggested that 'dream deprivation' led to subsequent compensation, showing that we 'need to dream'. The idea fired the imagination of writers outside of the research field, and extra excitement was added by suggestions that the 'dream deprivation' could cause loss of sanity. The state of affairs is now more mundane. Since dreaming is now known to take place outside of rapid eye movement periods, Dement's experiments could only have reduced, but not prevented dreaming. Loss of sanity has not been found. Current research leads to the conclusion that we not merely need sleep but *need both of the two kinds of sleep*.

The selective deprivation of rapid eye movement sleep was found to be followed by an increased amount when individuals were allowed to sleep undisturbed. However, it is not only the duration that is increased, but the intensity of its features. It has been found that dreams accompanying rapid eye movement sleep in which the profusion and vigour of eye movements have been great are more vivid and 'exciting' than dreams accompanying rapid eye movement sleep where the movements have been few and feeble.

When alcohol or sedative drugs are taken, the duration of rapid eye movement periods and the profusion of eye movements during such periods are decreased. If the drugs are consumed regularly the brain seems to get used to them and their effect on sleep disappears. If, however, the drugs or the alcohol are discontinued, a tremendous 'rebound' increase of rapid eye movement sleep appears, along with profuse eye movements and increased vividness of the accompanying dreams. Not only are the dreams intense, but they are also often terrifying, perhaps because the anxiety-reducing effect of the drugs has gone and a 'rebound' increase of anxiety appears.

Consequently when a person has been regularly taking sleeping pills and then tries to do without them, sleep is usually accompanied by unpleasant dreams, and is disturbed for over a month. More extreme is the case of the alcoholic. If he suddenly stops taking alcohol he can enter *delirium tremens*, a state accompanied by complete disorientation and by terrifying dream experiences even while he appears awake. He sleeps little but, when he does, his sleep consists almost entirely of rapid eye movement sleep with vivid dreams.

Although terrifying dreams or nightmares can be made more frequent by recent use of alcohol or drugs they do, of course occur sporadically for no apparent reason, or will appear in periods of life attended by a great anxiety. They were very frequent in the sleep of wartime soldiers who had experienced severe fighting. If, in the laboratory, anxiety-provoking films are shown to volunteers before bedtime, they tend to waken



The electroencephalogram machine, or EEG, shown above records with an amplification of one million times, the electric currents or 'brain waves' which the brain continually generates whether awake or asleep. The line patterns at the left show the brain patterns and eye movements which occur during sleep. In orthodox sleep, the eyes are motionless, the EEG waves big and slow. When wakened from such sleep, a person will usually say he has just been 'thinking'. About five times each night, during the rapid eye movement period, the pattern changes radically. It is immediately after this kind of sleep that 'dreams' are generally described. The woman in the photograph, *top left*, is one of many volunteers who sleep in the interest of scientific research.

Aldus Books

more frequently in the night, and have anxious or unpleasant dreams.

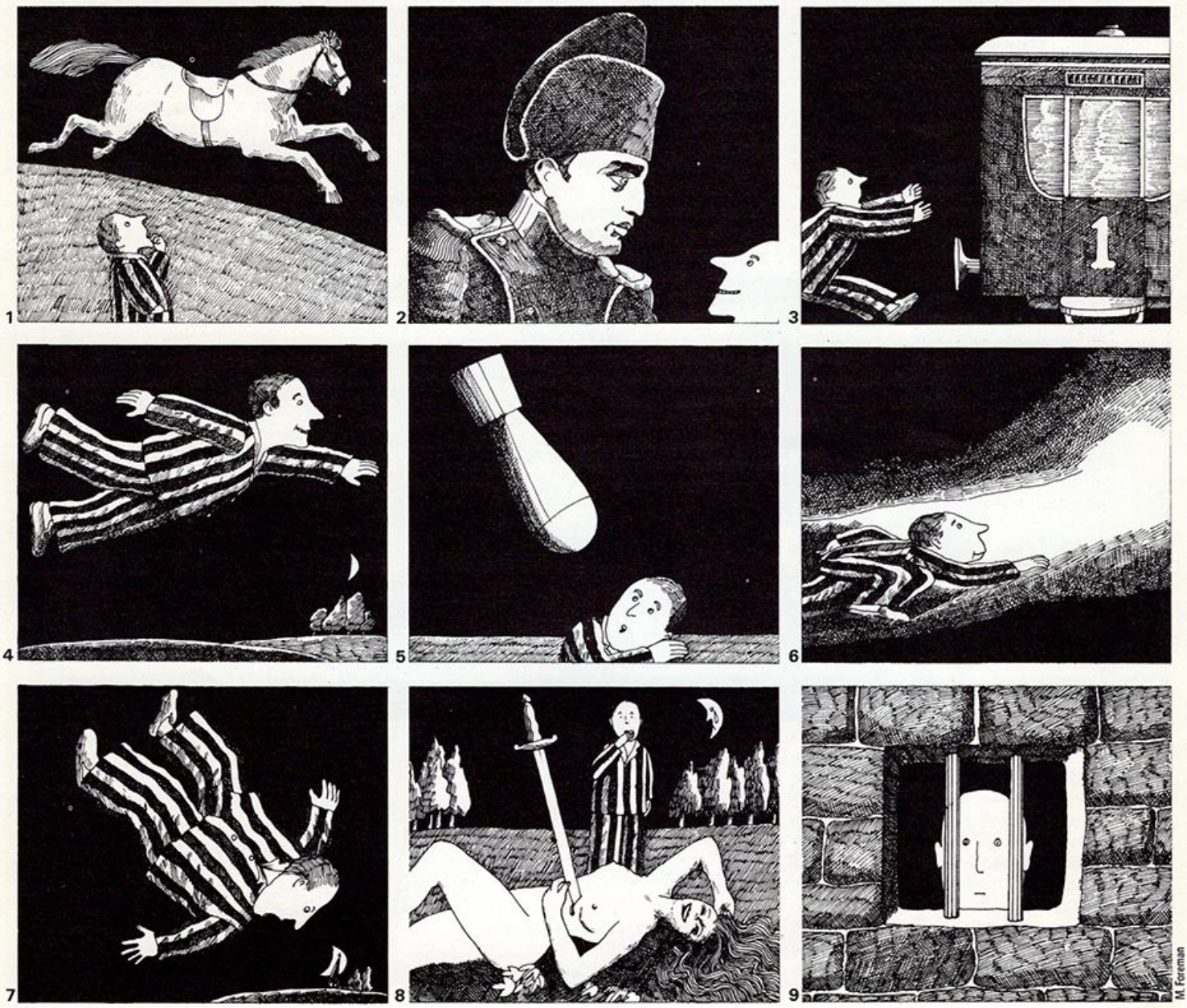
In rapid eye movement sleep, the muscles become remarkably flaccid – and actually undergo a paralysis. During this kind of sleep (but not during orthodox sleep) nerve-impulses from the sleep centres of the brain descend down the spinal cord and prevent the nerve cells sending out nerve-messages to the muscles that cause movement. This paralysis is total each time the eyes jerk.

It is possible that some body movements are related to the contents of a dream. In some EEG experiments conducted at the University of Chicago, Edward Wolpert measured the degree of motion in the muscles of sleeping subjects. He attached electrodes to their limbs and recorded the electrical impulses produced by seemingly motionless muscles. One very interesting series of results leads to the conclusion that dreaming and body movement are indeed related. A sleeping patient 'wired up' for experimentation showed extreme muscular excitation in the right hand, then in the left one, and finally in the left leg. When awakened, the dreamer asserted that he had picked up a bucket with his right hand, passed it over to his left hand, and then started walking.

He also found that other muscular activity, the vocalization or 'talk' which sometimes occurs in sleep, takes place between rather than during dream periods.

Experiments conducted on animals lead us to believe that if the paralysis were not there, we should rise up during our more vivid dreams and act them forth as if they were real. The terrified dreamer awakening from his nightmare, struggling to escape from his situation, is often briefly aware of the paralysis. As he becomes more conscious of his surroundings, the paralysis wears off, and he no longer wants to act out his dream.

Scientific research is slowly clarifying the mysteries of sleep. Old myths must be abandoned in the light of new evidence. 'To sleep, perchance to dream,' though poetically faultless, is scientifically inaccurate: we now know that to sleep is always to dream.



The *latent content* of dreams, the significance of dreams as symbolic expressions of unconscious conflicts, has been interpreted and reinterpreted by psychologists. Though there are certain dream symbols which consistently occur, it is now generally agreed that no universal interpretation can be attempted. A dream has a meaning which is particular to a specific individual. But the drawings above do illustrate some common dream images. The 'meaning' suggested for each is one of many possible, often contradictory, interpretations. 1 A riderless horse is symbolic of death. 2 An encounter with Napoleon may compensate for a feeling of inferiority. 3 Missing a train means that death has been escaped. 4 Flying signifies the desire for sexual activity. 5 Being bombarded by flying objects represents fear of sexual impotency. 6 Crawling through a long curved tunnel recalls the experience of birth. 7 A dream of falling symbolizes sexual gratification. 8 A beautiful naked woman whose breast is pierced by a sword is a fantasy of sexual intercourse. 9 Imprisonment signifies a severe neurosis.

1 Dalliance, says the dictionary, means amorous play. The word has been in the language since the early Middle Ages: the activity, far longer. Love-play is a natural, universal game – for animals as well as courting men and women.

Scala

2 The Greek philosopher Plato likened lovers to the split halves of a quince – only when they met would they be whole: modern lovers talk about 'togetherness', being 'meant for one another'.

Courtesy Art Museum Chantilly, France Photo/Giraudon

3 The love of Tristan and Iseult – doomed, since Iseult was married to Tristan's uncle – was the theme of much medieval legend and later the subject of an opera by the German composer Richard Wagner. They are the archetypal romantic lovers of legend. Tristan was brave and chivalrous, Iseult a beautiful princess.

Frank Habicht

Life Together

Falling in love

Here is an experience that delights and hurts, enhances and endangers. How in the world has humanity dealt with the hazards and joys of falling in love?

ROMANTIC love has been likened to a delirium, a sickness, an arrow that strikes deep into the heart. It can be pathetic and ludicrous, or rewarding and enriching. Love is no respecter of persons: some of the greatest love poetry has been written by men about men.

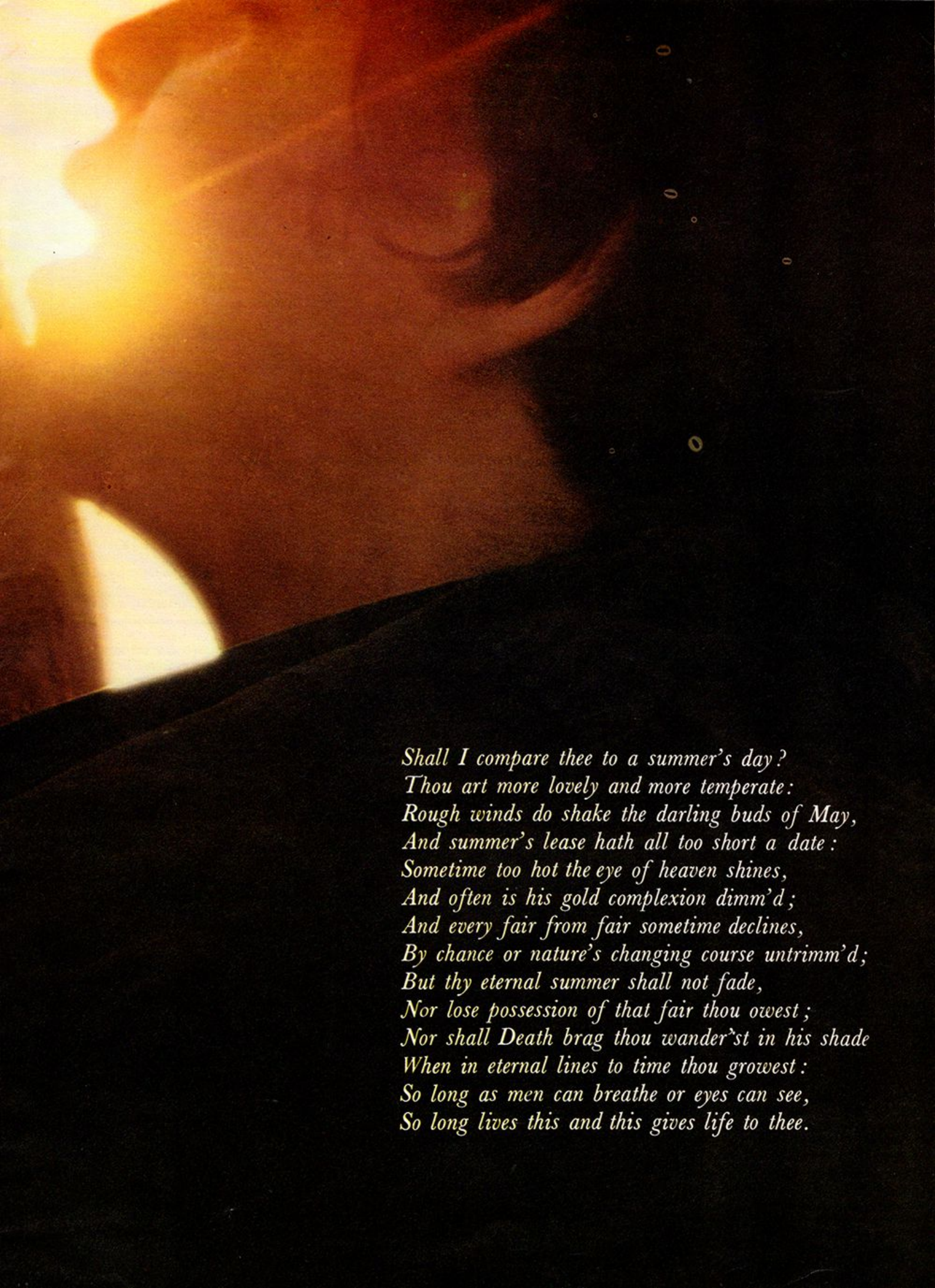
Romantic love can be a powerfully creative force – the inspiration of poetry, music and painting and the drive behind a man's urge to achieve success, fame and fortune. But it can be also an enormously destructive power. Unhappy lovers have been driven to suicide. Kings have given up their crowns for it. Politicians have threatened their careers. Countless ordinary marriages have been wrecked on it: women have suddenly packed their bags and left husband and children; men have disappeared overnight to be with their beloved.

It is not, then, surprising to find that in some societies – in traditional Japan or India, for example – romantic love is seen as anti-social: either the interests of the family or the state are considered more important than mere personal preference in the matter. For when girls and boys fall romantically in love they may put private fulfilment and pleasure before honour and patriotism. And if they marry completely unsuitable people, unhappiness is likely to result not only for themselves but for their entire social group. Shakespeare crystallized this problem in his study of the tragic strife of the Montagues and Capulets in *Romeo and Juliet*.

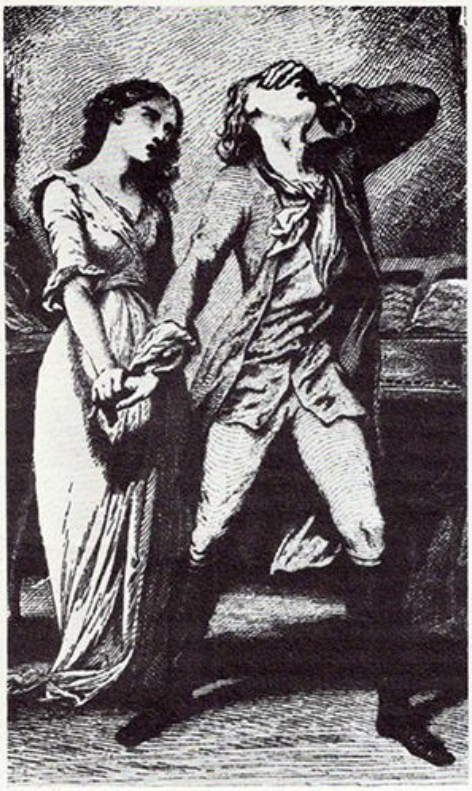
In yet other societies, romantic love has a brief, butterfly type of existence. It is thought of as something that adolescents engage in during a passing emotional phase, which is – fortunately in society's view – soon outgrown. Mature adults no longer expect it. This is the attitude taken by traditional peasant cultures where, after the short period of emotional freedom, the young adult – and particularly the woman – must put away all thought of romance and get down to the hard task of bearing and rearing children.

But in British and American society, romantic love is idealized and all growing children eagerly anticipate the experience. Some people, indeed, spend their entire lives looking for it passing in and out of one relationship after another in their frantic search. The epitome of this is the Don Juan, the man who flits continuously from bed to bed: however lucky he may appear to be in the eyes of other envious males, he never achieves complete emotional satisfaction and is always seeking the ideal woman. Some women, too, spend their lives searching for 'the perfect man'.


Twen Photo/Will McBride



Shall I compare thee to a summer's day?
Thou art more lovely and more temperate:
Rough winds do shake the darling buds of May,
And summer's lease hath all too short a date:
Sometime too hot the eye of heaven shines,
And often is his gold complexion dimm'd;
And every fair from fair sometime declines,
By chance or nature's changing course untrimm'd;
But thy eternal summer shall not fade,
Nor lose possession of that fair thou owest;
Nor shall Death brag thou wander'st in his shade
When in eternal lines to time thou growest:
So long as men can breathe or eyes can see,
So long lives this and this gives life to thee.



Radio Times Hulton Picture Library

The German poet Goethe's tale of the unhappy love of Werther for his Charlotte reputedly started an outbreak of suicides for love among impressionable youths.

Romantic love is not the prerogative of youth – though many young people seem to think it is. The love affair of Anthony and Cleopatra is one of the most famous in history, but many people forget that the pair were no teenage lovebirds but a couple approaching middle age.

British Museum Photo/Peter Clayton

Love caused a king to give up his crown: i 1936, Edward the Eighth renounced th throne of England to marry the divorce Mrs Simpson. He lost his country too – h has lived in exile, as the Duke of Windsor ever since. But the love proved long-lasting Romantic love is, however, not always s enduring: much great art mourns its brevity

SOME societies make allowances for adolescent sexual and emotional adventure and have evolved institutions to cater for it. This is kept quite separate from the idea of the love that is suitable for marriage. In America various formalities have developed to express the relations between young people on the college campuses: these involve the boy giving his sweatshirt to the girl, the mutual exchange of nightwear (with club or school symbols decorating them), and the gift of the boy's fraternity pin to the girl. On some campuses the rituals are even more elaborate. The customs include serenades of the girls by the boys, kissing ceremonies, candle parades or the passing through rings of flowers of those girls who have definitely committed themselves to a boy.

Other societies have even more formal systems for regulating early contacts between young people. In some parts of East Africa, cohorts of youths of roughly the same age live in bachelor houses where they may entertain their girlfriends and engage in erotic adventures. In Samoa boys have their first love affair with older, sexually-experienced girls who teach them the techniques of love: in their turn, the boys are later expected to sexually and emotionally initiate girls who have just reached puberty.

So, no matter how spontaneous and impulsive falling in love may be, there does seem to be a tendency in most societies to try to regulate it. But all over the world, the old think that the young are not behaving as they ought – in matters of love as in anything else. For to young people love is frequently not only an impulse but also a symbol. The mid-twentieth century young of many countries hold up an ideal of personal love in place of what they see as the major evils of society – war, police brutality, greed for consumer goods and money, the all-enveloping power of big institutions. Their cries are 'Make love, not war': 'Let's love one another': 'Love is lovely. War is ugly.' And not only do they carry banners; they may act on their beliefs, opting out of the normal concerns of society and devoting themselves to a life where personal relationships come first and work and social responsibilities poor seconds.

Romantic love, however, is a relatively new phenomenon in the history of the human race. Its first flowering came in medieval Europe – it was an essential part of the concept of chivalry. The perfect knight adored a high-born lady for whom he was expected to risk his life and perform any deed her whim dictated. It was a kind of love never linked with thoughts of marriage: in real life, women were chattels, entirely subject in law to their husbands – and their marriages were arranged for them by their families. But the troubadours sang of romantic love, none the less: an ideal love interwoven with the worship of the Virgin Mary, the queenly incarnation of perfection. For the 'highest' type of this courtly love, no reward – not even the simplest expression of affection from the lady to the self-sacrificing lover – was expected.

Romantic love has continued to be linked with the search for the ideal, an ideal all the more precious because it is always out of reach – 'The desire of the moth for the star, Of the night for the morrow, The devotion to something afar From the sphere of our sorrow', as the poet Shelley put it. Because of this it involves pain.

IN a way, such love is akin to the religious impulse. It partakes of the same idealism, of the longing for something beyond oneself, the reaching out for something intensely 'lovely' in the object of one's devotion. Mystics have used the language of lovers to describe their search for God, and some of the most passionate mystical writings communicate an experience similar to a lover's. St. John of the Cross, the Spanish mystic, wrote:

'The more I rose into the Height
More dazzled, blind and lost I spun.
The greatest conquest ever won
I won in blindness, like the night.
Because love urged me on my way
I gave that mad, blind, reckless leap
That soared me up so high and steep
That in the end I seized my prey.'

Like mystical experience love confers a special grace on the lover. For it is not something that can be willed, planned for or, in the last resort, earned: it is something that descends on the lover almost in spite of himself and in spite of his own unworthiness. The German poet Goethe said 'Love concedes in a moment what we can hardly attain by effort after years of toil.'

The American politician Nelson Rockefeller risked offending public opinion when he wed 'Happy', who left the young children of her former marriage for him. Some societies frown on romantic love because it can cause social chaos as well as personal misery – like the love of Romeo and Juliet, shown below in the Zeffirelli film.

Keystone

Paramount Pictures

In psychoanalytic terms, falling in love occurs when inner fantasies can be related to an actual person in the outside world. The individual finds the best that is in himself outside himself, and thus the inner and outer worlds become one. It has been suggested that 'in love, man is only loving himself. Not his empirical self, not (his) weaknesses and vulgarities . . . but all that he wants to be, all that he ought to be, his truest, deepest, intelligible nature . . .' Love of this kind is, in fact, love of the lover's own ideal self.

The growth of love and the ability to express it can, however, be frustrated and circumscribed. In Britain the 'stiff upper lip', toughness and aggression have been considered the male ideal; they form part of the influential public school ethos. Though this concept of masculinity is losing ground today, one writer has pointed out that for many men it has meant a 'taboo on tenderness', an inability to express gentle feelings. So the Englishman is traditionally thought to be ham-fisted in love. Yet tenderness like that of a mother with her new-born child is an essential part of adult love, both in men and women.

A further problem is the fact that, in Britain, first love – which is often coincident with the first tentative sexual experiments – may take place in an atmosphere of taboo, at once hurried, concealed and shameful. And not only may the young people be ill-prepared emotionally, but they may be without adequate knowledge of contraceptive techniques and their love-affair have dire and life-long consequences for the girl if she conceives an unwanted baby.

When they fall in love, many men and women seek, in their beloved, their own mother or father. For in the love relationships of adulthood the satisfactions of early childhood are recreated – and often the frustrations too. This is why people may run into trouble in their love relationships if they have not worked through the problems arising out of stresses in their childhood. Jealousy of a younger brother or sister can, for example, lead in adult life to intolerable jealousy of anyone who seems to be taking away the love of the beloved person; it may even result in *crimes passionels*. In any case, because of the intensity of the feelings involved, love can be very close to hate.

Some people are unable to fall in love because they too carefully guard themselves from feeling any overpowering emotion. They may put up a smoke screen or a hard, shell-like exterior between themselves and the outside world. Without the ability to love, such men and women are often frighteningly alone. Sometimes, if they have not become completely narcissistic or self-sufficient, they fall in love later in life, when they have had time to feel more secure and have learnt to trust their own emotions more surely. Then they may know the raptures of middle-aged love. Antony and Cleopatra were no twenty-year olds but a man and woman of mature age – and their love was no less passionate for that.

In love, every sense is heightened: the lover sees, feels everything more keenly so that the skies are more vividly blue, the whole world richer with pleasant sensations. It is this keenness of the senses that is sought by many of those who habitually take drugs like LSD. But it is sad that they can enter on this experience only in their aloneness and not, as in love, in the joy of a meaningful relationship with another person. When the drug experience has worn off the individual is left just as solitary and the world is mud-coloured again. But in love the experience is capable of developing and becoming richer with time.

People in their seventies and eighties can still fall in love. The longing to love and be loved starts in infancy and remains, unless blocked, for a lifetime.

Frank Habicht

When lovers meet and begin to grow towards one another, to complement each other's personalities and to answer each other's needs, it seems to them as if they and they only could ever have loved one another: they were 'meant' for each other. The Greek philosopher Plato likens lovers to the two split halves of a quince: when they meet they are whole again.

BUT because romantic love is closely akin to worship, it is only too easy for the lover to idealize the beloved and then feel cheated when he or she proves to have feet of clay. When the lover is able to see and to accept the beloved's imperfections and yet go on loving, then he or she has probably passed out of the state of being *in love* and into the more lasting one of *love*.

Anyone who hopes to retain the state of rapture associated with falling in love has to create a set of circumstances which is highly contrived and artificial and which could prove an intolerable emotional and physical strain: frequent absences from the beloved must be engineered: the couple must not be bound down by the needs of children or other dependants or by the complicated mechanics of home-making and income-earning. Only through all this effort, they feel, will their love keep its pristine rapture. They are unwilling to let their love develop beyond its early manifestations because they fear the consequences – total commitment or, perhaps, loss.

Some couples in love often fear that their love will gradually turn into mere affection. They seize on love feverishly, trying to catch and retain the moment in all its glamour, colour and passion. Here lies part of the tragedy of springtime love – that it cannot be grasped and held for ever. Some of the most moving works of art have played on this theme. William Blake crystallized the sorrow when he wrote:

'He who binds to himself a joy
Does the winged life destroy;
But he who kisses the joy as it flies
Lives in eternity's sunrise.'

Yet, although anyone who has just fallen in love can hardly believe it, romantic love is only one kind of love. Even the most ardent lovers often come to realize that the feelings they first had, the rapturous state of being 'in love', were but the seeds of everything they will become in the future. For falling in love is only the beginning. The love can change and deepen, find expression in a life created together, and in the birth and care of children. And through these children and the developing relationship, the couple's love will stretch further and further into time: the fragile, delicate flower of romantic love become the mature love of a lifetime.

Health and strength need not go together. The obese can have strong muscles, but excess fat puts excessive strain on the heart and other parts of the body.

Frank Habicht

Enemies of Man

When fat can be fatal

Obesity is a dangerous way of life. Here, a dietician answers the questions that highlight the risks to health you may run once you let fat run away with you

HOW funny did Humpty Dumpty, Falstaff and Fatty Arbuckle really find their fatness? The stress of carrying an extra two stones about, every day, may be most unpleasant. To compensate for the discomforts of fatness the fat victim may find further solace in food. *Overeating leads to overweight. Extreme overweight is obesity.* Ten pounds above average weight for age and height is a danger signal. Twenty pounds is overweight. Thirty pounds over the average is obesity. And obesity is a special condition to which doctors are paying increasing attention.

What sort of lives do the obese lead? What sort of a future can they look forward to? How many obese people are there? The obese may have few reasons to be pleased with life. Doctors list the risks of obesity as high blood pressure, heart disease, coronary thrombosis, ulcers in the veins, diabetes, infertility and impotence. The picture is not a pretty one, for it has been shown conclusively that compared with their contemporaries the obese are more likely to die young. Insurance companies will certainly penalize them, and well-fitting clothes may be hard to find. Some people seem to use their obesity to hide themselves from society. Because they are fat they cannot participate in many of the normal activities of life. They feel that if they do not expose themselves then they will not be looked on as objects of ridicule. This is what they fear most. Yet there *is* a future for the obese person, particularly if he can discover the deep-rooted cause of his extreme overweight. It may be that over a period of years his problems have spiralled. The effects of overeating may have been accentuated by too little physical exercise. Overeating may have been caused by a sense of guilt – a guilt only alleviated by yet more eating.

Scientists in the United States have worked out that 30% of Americans are more than 30 pounds above average weight – that is, obese. In Europe the extent of obesity is lower: estimates place it at 20%.

How do doctors react towards obesity? How do they define it? How is it measured? Only recently have doctors become aware that obesity should be looked upon and treated as a disease in itself. But most doctors have too little time to treat someone who is not actually ill.

Doctors and statisticians have combined to work out the average weight of adults by height and age – *as they usually are* – and the *desirable weight*. In every case the desirable weight is well below the average weight. Yet an insurance company assessing a prospective policy holder will consider the desirable, rather than the average weight the optimum for long, illness-free life. But it is self-deluding to study the weight charts and say 'I am within the limit for my age and height' or try to rationalize being overweight by saying 'I have big bones'. Like the reasonings of the alcoholic, these are the early warnings of obesity.

Mary Evans Picture Library

Patent aids to dieting, with seemingly miraculous powers, still abound today. Yet their efficacy may be as dubious as that of this seaweed extract. Drugs may help the obese by reducing the appetite.

There is a medical test for measuring obesity. Doctors call it *the skinfold test*. By using calipers to 'pinch' the skin, a fair estimate, in inches, can be obtained for the amount of fat deposited under the body surface. The skinfold test is a more accurate measure than the actual weight of the obese person. Fat is a very light substance, much lighter than water. The body tissues directly under the skin contain 70% water, but if they are invaded by fat, the total water may drop to 60%, and they therefore become lighter. Thus two men who weigh the same may have very different skinfold measurements. One may have a value of four inches of fat-invaded tissue under the skin, while the other, possibly an ex-athlete, whose tissues contain much heavy muscle, may have a value of two inches. The first man would be classified as obese, the second as merely overweight.

How is obesity caused? How does the body work to produce it? Does it vary with sex? Most people have a body mechanism which maintains their weight at the right level – balancing caloric intake with consumption of energy. A young man can eat as many as 3,500 calories a day without putting on weight. But only a few can keep this up for long without a change of waist measurement. In his thirties a man's struggle begins and, without care, is often lost in the forties. A man might burn up four tons of food in twenty years but, with exercise and an active life, might use up exactly the energy produced by the food and thus stay slim. But an error of only one per cent either way means he will gain or lose 140 lbs.

NORMALLY, a man gains weight after the age of 25. Requiring gradually less energy, taking less exercise and, once married to a wife whose culinary efforts he feels unable to reject, he is overweight if he is 20 lbs above the average for his height and well on the way to obesity. For a woman, the strains of life that may cause her to overeat come at different times. The sexual and hormonal changes connected with adolescence produce intense emotional feelings. A young girl may use food to temper the strength of such feelings, and the suddenness with which they appear. During pregnancy, different influences can come to bear on a woman. Myths about childbirth are innumerable, and the expectant mother, concerned about the future of her unborn child may really believe that she has to eat for two. It could be, however, that she is adding to her problems. Every mother over average weight places herself at *some* risk, although this may be very small. The most common time for things to go wrong is at labour, which may be long and painful for the overweight mother.

When does obesity start? Is it inherited? Obesity, as distinct from overweight, usually starts with children. Overnutrition of children does produce greater height, but also greater weight. A recent retrospective study, which is questionable as an objective survey, nevertheless shows that of obese adults 30% were obese in childhood and that of a sample of obese children, 80% were obese as adults. These findings of medical statisticians in the United States, Germany and Great Britain confirm these figures.

Obesity in children can occur as early as within six months of birth. One case is known of a baby 8 lbs overweight at five months. The baby with a fat mother starts life at a disadvantage. Because the breast is full of fatty tissue,

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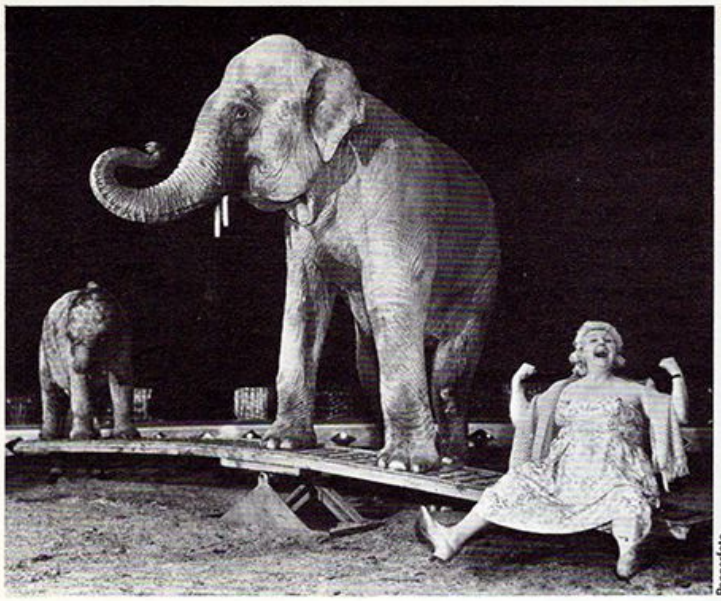

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Frank Habicht

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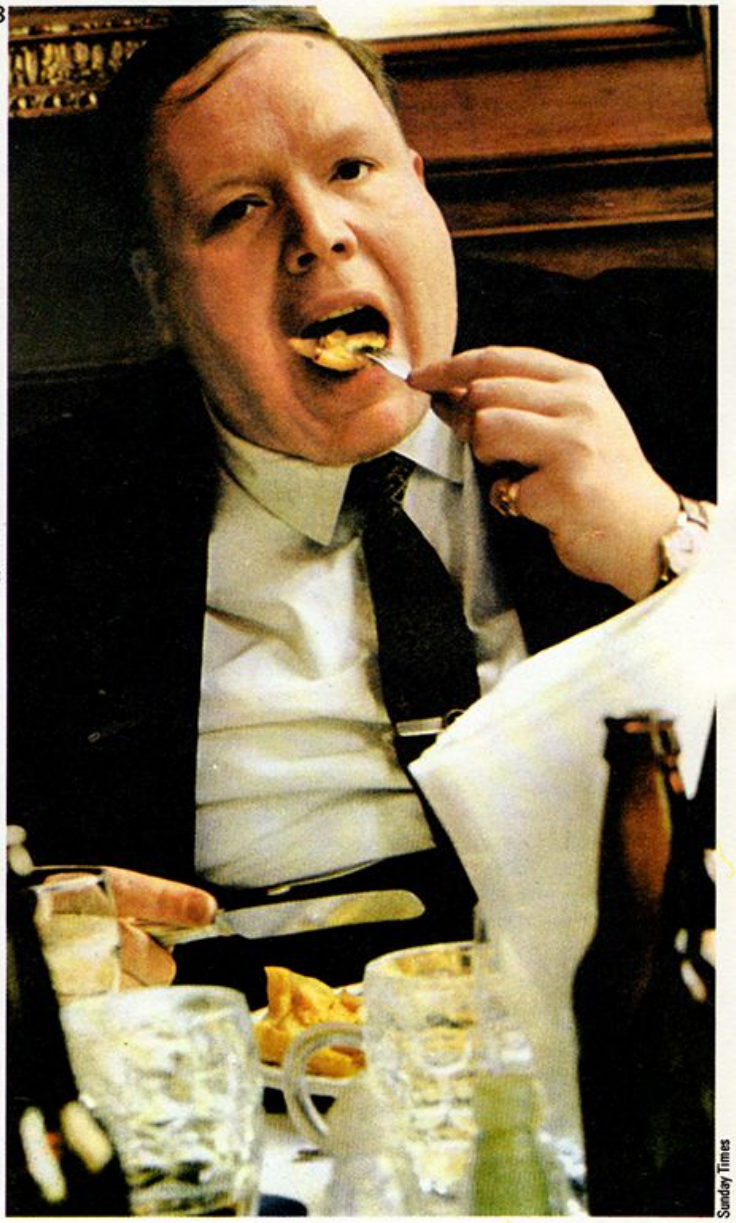


Sunday Times

1 Some fat people accept their obesity and use it to advantage. 2 Others are ashamed of fatness and try to disguise it. From birth, some of us will have more tendency to be fat than thin, but the tightrope on which the body metabolism balances is eating – its quality *and* quantity. 3 The true gourmet can enjoy good food in moderation and stay thin, the gourmand will always risk obesity. What we eat is often governed by social factors. It may seem churlish to refuse an ice cream on the beach or to join in at lunch in the café, yet any cure lies between the obese person and himself.

milk is produced only painfully, so the mother relies on sweetened processed milk and filling cereals which can help to form a pattern of overeating for life. In the mind of the very young, food is linked with security. The sense of security experienced at the mother's breast is irrevocably associated with food. Social patterns play a part, too. Meals hold a dominant place in family life. Eating is a ritual, celebrated in all religions, and mealtimes are, more than any other time, periods when the family is together. Mothers may placate their children with food, and as a result children learn that if they scream, they will be fed without question. A few years later, the pattern may be reversed. Convinced that they will be failing in their duty if they do not make children 'eat up', parents make the young overfill stomachs that are already satisfied. The capacity of the stomach is very dependent on the size of individual meals. A stomach used to a particular state of fullness will continue to demand sufficient food to attain that state at every meal. To this extent the appetite can be conditioned, and perhaps parents should congratulate children on *not* wanting to fill themselves unnecessarily.

Heredity *does* matter. Doctors have shown that half the children born to couples where one parent is obese are themselves grossly overweight. If both parents are obese, then four of five children born to the couples are obese.

Can obesity be cured? What can a diet do? Are drugs any help? Different factors work together to produce an obese person, but they can be divided into three main groups. Point by point these are, 1. Early obesity, governed by family factors, which continues into adult obesity. 2. Stress or neurotic obesity arising from varied psychological causes. 3. Gradual obesity.

Two shining beacons beckon the fat to slim. If they reduce to normal weight, the risks of coronary heart disease and all the other killing associations are reduced to normal. Reduction to average weight may help overcome the stresses which were the motivations of obesity. But it is not easy to break the habit of overeating. Physical activity may prove extremely unpleasant, and hunger may stretch willpower to its limits.

The first task in reducing is to find a suitable diet and mix it with some other acceptable ingredient to bring weight down. The second is to admit your weakness, such as bread, alcohol or nibbling nuts. Fat people, once obese, do not necessarily eat more than normal people – they just keep their fat deposits at a constant level. Most people know they have to cut down on carbohydrates,

and many are very knowledgeable about diets. The main thing to avoid is an inappropriate diet designed to achieve a weight loss too quickly.

A diet should be palatable, nutritious, socially acceptable and simple. It should be regarded as a normal way of eating, not as something special. The most usual one is a low carbohydrate diet, and this has proved itself successful if accompanied by sufficient determination to produce a regular improvement. Add to this mild but regular and frequent exercise, such as walking, deep breathing, and regular visits to one doctor – with detailed progress reports – and a gradual loss is likely. The daily decrease levels off as the ideal weight is approached, but the gradual realization that weight is going down, combined with an increase in feelings of energy and well-being will act as added encouragement.

There are many diets. Some advocates of health foods rely mostly on fresh fruit and vegetables, others on meat and salad. At the extreme end of the scale, doctors recognize that three sorts of starvation must be guarded against in any form of strict diet. These are protein starvation, total starvation and liquid starvation. If the body is deprived of proteins, the metabolism is upset and abnormal acids form in the blood stream. Known as acidosis, the presence of these acids can cause raging thirst and vomiting. In total starvation, the body has no energy supplies coming in from outside, so it obtains the food it needs by, in effect, 'eating itself'. This means that the body breaks down fats into sugar, carbon dioxide and energy, but it also needs proteins. The body muscles are a rich source of these essential proteins. When used, internally, by the body as a source of energy, they break down into the amino acids of which they are made. Bad breath is the first sign, and is followed by a visible wasting of the muscles and listlessness. Liquid starvation is often used for quick weight reduction. The water in the body makes up 60 to 70% of its weight, and in the course of normal breathing, sweating and excretion up to 3 pints of water are lost from the body every day. Dieters argue that if they drink less liquid each day than the body loses, then their weight will go down. This is true; but what they do not realize is that without water the body cannot perform its vital functions. Man can live longer without food than without water.

DRUGS may help a little. As yet, there is scant evidence of their efficiency, but generally it seems that while the commercial dietary aids are not a long-term solution to obesity, some pharmaceutical aids may provide an answer if allied to a diet. One particular drug, based on extracts from the thyroid gland has demonstrated remarkable results. This drug speeds up the rate at which the body burns food. The amphetamine drugs, such as benzedrine and dexadrine act on the appetite – controlling centre of the brain. If taken at least one hour before meals, they *may* reduce appetite. The latest developments are the diguanides, which seem also at this stage especially safe for people who also suffer from diabetes as well as obesity. The mystery of how these drugs work has still to be solved. Surgical experiments to help the obese include the insertion of a false gut which by-passes the stomach, and so prevents food from entering this part of the alimentary system. Yet for one fifth of the chronically obese, help is outstanding.

Have attitudes changed? Can they change? We have come a long way from our primitive admiration of the huge physical form. The Venus of Willendorf, for example, is grotesque by today's standards of beauty. By modern standards they are far from perfectly healthy. Large buttocks in women have been admired as a sign of fertility. Large breasts have had constant admirers, and some women eat in order to have larger breasts. In Africa and the Middle East and in Western civilizations at certain times thin women have often been despised, while fat women have rarely merited disfavour. Maybe fat women not only seemed – erroneously – more fertile, but were, to themselves and their husbands, a symbol of prosperity. Even today, good and famous women cooks have looked upon slimming husbands as a potential public insult to their skill. As long as people remain ignorant about the dangers of obesity, it will continue to be a problem. Contemporary city-dwellers eat just as much as their counterparts of a century ago, but take far less physical exercise to burn up the calories. They lead sedentary lives, surrounded by devices that minimize the demands on their physical energies. Over large areas of the world, hunger has been eradicated. Obesity has, in part, taken its place. A hungry world idealizes the fat woman, while conversely, our overweight world, as any fashion magazine shows us, loves the skinny one.

Average weight of adults (in lbs in indoor clothing)

	Height in shoes	Age 17–19	20–24	25–29	30–39	40–49	50–59	60+	Desirable weight in lbs medium build
Men	5 2	119	128	134	137	140	142	139	118–129
	5 3	123	132	138	141	144	145	142	121–133
	5 4	127	136	141	145	148	149	146	124–136
	5 5	131	139	144	149	152	153	150	127–139
	5 6	135	142	148	153	156	157	154	130–143
	5 7	139	145	151	157	161	162	159	134–147
	5 8	143	149	155	161	165	166	163	138–152
	5 9	147	153	159	165	169	170	168	142–156
	5 10	151	157	163	170	174	175	173	146–160
	5 11	155	161	167	174	178	180	178	150–165
	6 0	160	166	172	179	183	185	183	154–170
	6 1	164	170	177	183	187	189	188	158–175
	6 2	168	174	182	188	192	194	193	162–180
	6 3	172	178	186	193	197	199	195	167–185
Women	4 11	102	105	110	117	124	127	129	98–110
	5 0	105	108	113	120	127	130	131	101–113
	5 1	109	112	116	123	130	133	134	104–116
	5 2	113	115	119	126	133	136	137	107–119
	5 3	116	118	122	129	136	140	141	110–122
	5 4	120	121	125	132	140	144	145	113–126
	5 5	124	125	129	135	143	148	149	116–130
	5 6	127	129	133	139	147	152	153	120–135
	5 7	130	132	136	142	151	156	157	124–139
	5 8	134	136	140	146	155	160	161	128–143
	5 9	138	140	144	150	159	164	165	132–147
	5 10	142	144	148	154	164	169	–	136–151
	5 11	147	149	153	159	169	174	–	140–155
	6 0	152	154	158	164	174	180	–	144–159

Growing up to babyhood

Soon, the mother can feel her child stir within her. We now understand the pattern of his development. But what finally triggers the start of labour?

BY the end of the third month after conception the baby is more or less complete. He is recognizably human, though only about three inches long. Already the systems of his body are highly developed. His nerves and muscles and the connections between them are working, and his reflexes are becoming organized. His heart pumps 50 pints a day, and his sex organs are clearly distinguishable. He can move spontaneously though his mother cannot yet feel him.

During the fourth month the foetus grows about five inches in length and will increase his weight from about ¾ oz. to 4½ ozs. He has easy freedom of movement: he can bend sharply from the waist and hips, twist his body, roll over completely and even turn somersaults. Only the astronaut, free moving in space, experiences similar feelings of weightlessness.

Meanwhile the placenta or afterbirth, an organ vital to the foetus' welfare, is also developing in the womb. Only in recent years has it been studied seriously. It has many known functions – and every year scientists discover new ones. Basically the placenta is a membrane; fully developed it is some 8–14 inches across. But recent estimates show that the actual membrane, packed into this space more tightly than any parachute, has a surface area of over 1,000 square feet. Fold upon microscopic fold makes this possible – even the cell walls are thrown into folds of their own.

The fully-grown human placenta has often been described as the size and shape of a large dinner plate. It is attached to the wall of the uterus: the mother's side of the placenta is embedded in the wall and loosely attached. The attachments are bathed in the mother's blood which is, however, importantly kept separate from the baby's by fine cell membranes.

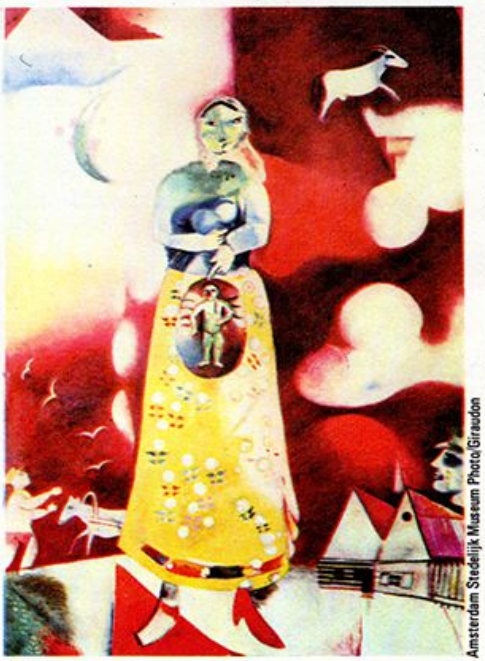
The baby's side of the placenta is covered by the thicker foetal membranes. The outer is part of the mother and the inner is part of the foetus. From the middle of this surface emerges the umbilical cord which is also covered in the foetal membranes.

There is normally no direct contact between the two blood streams of the baby and the mother. These are kept separate by the placenta unless, as sometimes happens, there is a haemorrhage of the baby's blood into the mother's. The blood supply to the placenta comes from the umbilical arteries which run from the baby's heart through the umbilical cord. The placenta is divided into fifty or sixty subunits each of which is supplied by a branch of one of the umbilical arteries. These subdivide many times to make an extensive network of capillaries, or tiny blood vessels. The blood is collected again into more tiny vessels and drains back into the foetus through a main branch of the umbilical vein which also runs in the umbilical cord.

On the mother's side of the placenta, blood enters through a number of spiral arteries and flows through a continuous space so that a large area of the foetal side is exposed to the maternal blood.

The placenta acts as a lung into which the baby's heart pumps blood to pick up oxygen and eliminate carbon dioxide. It also provides the food supply. Protein in the form of amino acids, carbohydrates

Russian born Marc Chagall's *Maternity*, painted in 1913, imaginatively captures a dream-like image: the child in his floating mother's skirt of flowers.



Amsterdam Stedelijk Museum Photo/Giraudon

in the form of sugars, and other body building substances including calcium, iron, and copper flow through the barrier from the maternal into the foetal blood. The waste products from the baby flow the other way; they are transferred to the mother's circulation and excreted by her along with her own. Water also passes through the placenta, as do electrolytes through which the placenta regulates the acid base balances.

In recent years evidence has accumulated to show that the placenta does a great deal more than act as a barrier. It produces hormones which can profoundly influence the pregnancy, and by transferring antibodies from the mother to the foetus is responsible for protecting the baby from infection.

Another part of the foetus which has been little studied but is probably of considerable importance is the umbilical cord. This structure carries all vital substances from mother to baby. It minimizes the risk of snarling by being constructed in a tough, spiral shape. Even so twisting does occasionally happen and may damage or kill a foetus or cause abortion in the early months. For reasons which we do not know most babies' cords seem to coil to the left.

At the beginning of the fifth month the baby is about a foot long and weighs about one pound. His mother can now feel him kicking. During this month he grows about two inches in length and gains about 1½ lbs. in weight. The lanugo or baby hair begins to grow on his head and eyebrows. His bones and nails harden, nipples appear, and his heart beat is loud enough for a doctor to hear through a stethoscope placed on the mother's abdomen; if there are twins the doctor may be able to hear two heart beats. His muscles become stronger and his mother is aware of his tremendous activity. Finding himself a favourite resting position, he will have periods of sleep and waking like a fully developed baby. Being small he is still very mobile in the uterus and probably frequently turns somersaults. As his size increases he cannot do this so easily.

DURING the sixth month he begins to accumulate fat under his skin and his whole body becomes covered by the fine fuzzy lanugo and *vernix*, a white greasy protective substance. During this month he can grip his hands tightly and may even open his eyes. If he should unfortunately be born at this time he is probably able to keep breathing in the world outside, at least for a few minutes or hours. He may even have a small chance of surviving for longer, especially if he is given special care in an incubator.

During the next three months the foetus becomes increasingly able to be independent. He usually gains more than one pound during the seventh month and four more pounds, or even more during the following six weeks. His hair grows long and most of the lanugo is shed. He has less room in which to move about

Eleven weeks after conception the foetus has eyes, ears, nose and mouth. Beneath closed eyelids are the dark pigments of his eye. From his navel the umbilical cord links to the placenta and vital supply of oxygen and nutrition. As yet without fatty tissue, his hands and feet, fingers and toes are thin skinned, thus the clarity here of bones and blood vessels.

and he may become rather cramped.

Reaching an adequate size is something the foetus must do if it is going to survive in good health. Doctors and scientists are paying a great deal of attention to foetal growth and its failure. A failure to grow adequately may occur in any pregnancy but is more common in first babies, in the babies of women over 35 years, in babies of women with high blood pressure, short stature or who come from the poorest social groups, and particularly those who have already had babies of abnormally low birthweight or a previous stillbirth. Women who smoke and women who bleed early in pregnancy are especially likely to have small babies. The presence of more than one baby in a pregnancy is also liable to keep the foetus small.

AFTER 28 weeks of pregnancy the foetus is old enough to have a chance of surviving should he leave the womb. He is therefore said to be 'viable'. But it is only a slender chance. In medical terms, a baby born after the 28th week is regarded as a birth, one born before that time as an abortion. But this is an arbitrary distinction. Most babies born at 28 weeks do not survive, occasionally one born at an earlier date is lucky enough to live.

During the remaining weeks before the baby is born he increases in size and may become a tight fit in the womb, especially if he is a first baby. He stops his frequent somersaulting and usually takes up a more or less fixed position. Most often this is head down, the most advantageous way to be born. Sometimes it is bottom or feet downwards, in which case he is called a 'breech presentation'. It is very important that he does not lie across the mother's body because he cannot be born normally if he lies like this: his arm or shoulder will try to emerge first which doubles up the baby sideways and makes it impossible for him to pass through the birth canal.

Labour occurs, on an average, after 280 days of pregnancy (reckoned from the first day of the last menstrual period). It is calculated in this way because the date of conception is not usually known accurately and this has been found to be the most satisfactory method of assessing when the baby is likely to be born and also when it *should* be born. The vast majority of babies are born within a week either way of this date and this is the safest time. Babies born earlier or later than this are more likely to run into difficulties, particularly if they are more than a fortnight early or late. For this reason obstetricians try to prevent births occurring prematurely unless there are strong reasons why prolonging the pregnancy is undesirable. Also, if the pregnancy has gone on longer than the dates suggest that it should do, the birth is often speeded by drugs or simple surgical means.

No one knows precisely what causes a woman to go into labour, but there are three main theories. One is that it occurs through mechanical irritation. Towards the end of pregnancy the uterus becomes increasingly irritable, producing contractions which gradually increase in frequency and strength. The increasing size of the foetus causes the uterus to distend which may make it more irritable. The pressure of the head of the foetus on the lower part of the uterus also seems to be influential in causing labour. Sometimes there may be reflex irritation of the intestines. This is why a woman who is almost due to have her baby may sometimes be triggered off by a dose of castor oil.

Another theory is based on hormone changes. Sometimes labour can be started by giving injections of *oxytocin*, a hormone secreted by the pituitary gland, and something of the same effect may occur spontaneously. Or it may be that an increase of *oestrogen* or female hormone sensitizes the uterus to some other hormone, perhaps from the placenta.

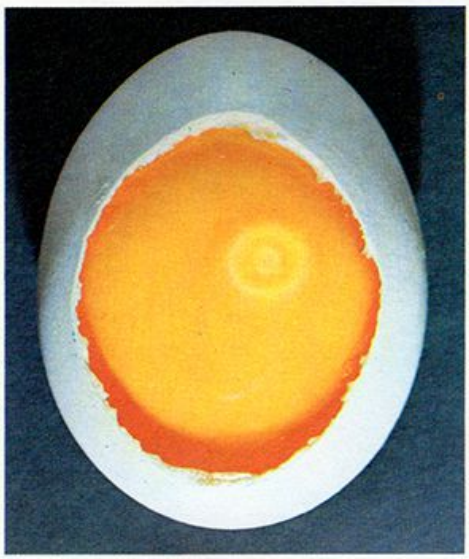
A third theory is that some substances produced in the chemical changes that take place in mother or baby may stimulate the uterus to contract.

FOR obvious or mysterious reasons, a pregnancy sometimes ends too soon. When this happens before the 28th week of pregnancy it is called a miscarriage or 'abortion'. In medical terms the word abortion covers all premature endings of pregnancy before the 28th week and does not refer specifically to the deliberate ending of pregnancy which is usually known as 'termination of pregnancy'.

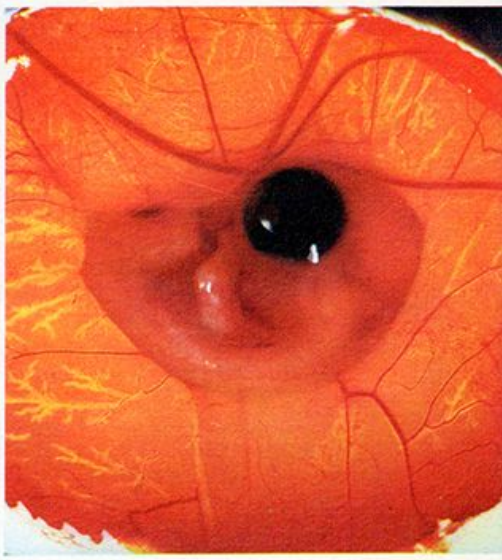
An abortion may only be 'threatened' for

For a chick, nature has another way out.

Twelve hours after the beginning of the chicken's incubation within its egg, a germinative disc can be seen, a tiny spot marking the new life's origin.



Six days later: surrounded by a vascular network, the eye, heart and internal organs of the abdomen with their umbilical cord all speedily develop.



At 15 days the eyelid and the eye with a pigmented iris are visible. The horny beak, able to open and shut, develops a small bump, a future tool for escape.

The 17 days old embryo folds his head under a wing, limbs on his stomach. Filling the egg, he can be heard to cheep as his beak opens for air.

instance when there is mild loss of blood or pain. As long as the lost blood is mild and the pain irregular there is likely to be some chance of saving the foetus. Many women carry on successfully with pregnancy after a threatened abortion though there is a slightly increased risk to the child. If the loss of blood is heavy or the pain occurs regularly, as in labour, the abortion is said to be 'inevitable': there is then virtually no chance of saving the foetus.

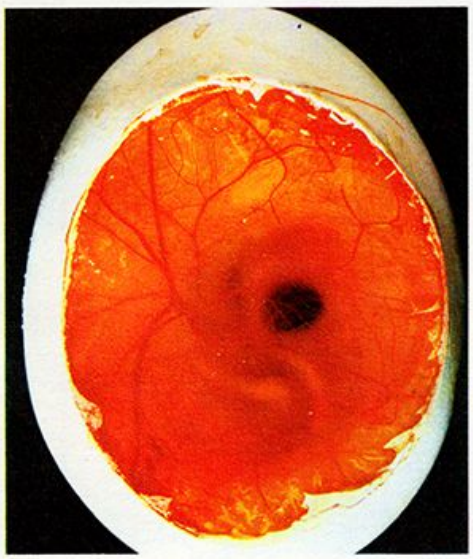
Spontaneous abortion is often the result of maldevelopment of the foetus or of its placenta. Many foetuses which are aborted spontaneously are found to be deformed on close scientific examination, but in many cases the baby seems to be normal. For some reason the mother has been unable to contain her normally developing child. She may have a detectable abnormality which makes her unable to carry the child without medical assistance. Perhaps there is something wrong with the uterus itself or with her hormone balance. There is a great deal of medical treatment available for women who suffer from repeated spontaneous abortion. Much can be done to keep the foetus growing in the uterus until such time as it can live an independent existence outside.

Only in recent years have we come to realise the importance of foetal life. Its quality has a profound effect on everything that happens later to the individual. The growth and health of the foetus is influenced to some extent by its own inherited makeup, but this is profoundly influenced and modified by its environment probably from the very moment of conception.

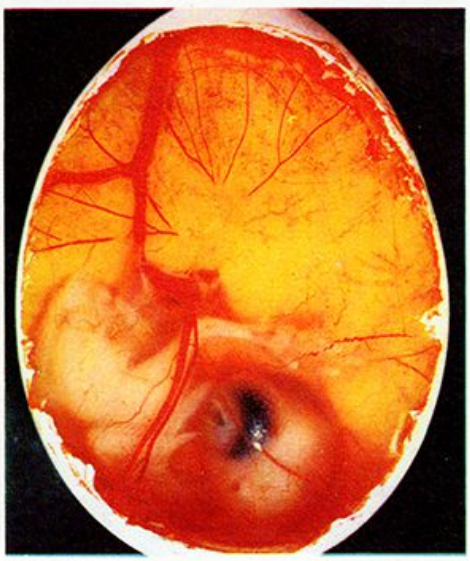
The placenta which, after the very early stages, is the baby's link with the mother must be healthy if a healthy baby is to develop. Quite apart from the quality of the placenta itself, it must be healthily attached to the mother's uterus, usually to the upper part of it. Low-lying placentas, particularly those that cover the mouth of the womb, tend to cause difficulties. Even if they do not interfere with the baby's growth, which they may not do if they are in themselves healthy, they will tend to cause difficulties particularly during labour as the time of birth approaches.

The uterus itself must be a suitable bed and container for the baby. It must grow in the proper manner, provide a good blood supply not only to itself but also to the placenta through which to nourish the growing foetus. It can only do this if the mother herself is in good health and, ideally, the mother should be free from disease and extremely well nourished throughout her pregnancy. In practice, healthy babies can often come from mothers who are ill during pregnancy and from those who are poorly nourished. But in general the better the health and nutrition of the mother the better will be the baby's chances of a healthy nine months in the womb and a robust delivery and survival.

The nine day old embryo, two centimetres wide, has a head as big as his body. Muscles form, cartilage solidifies and the beak's upper part begins to grow.



At 13 days the embryo moves briskly, almost fully formed. Feathers can be glimpsed, bones harden, lungs develop and the yolk is absorbed into the cord.



Twenty-one today: the chicken pecks a circular line to freedom. It can take between an hour and two days. Outside help might rip a delicate vein.

He has made it: the shell is broken in two as if cut with a knife. Still damp from the egg, the chicken thrusts his questing head into an unfamiliar day.

Mondadoripress

IN 1962 the thalidomide tragedy showed an incredulous world that babies could be damaged in their mothers' wombs by substances which did not harm the mother at all. Although this had, in fact, been known by scientists for many years, most other people did not believe it. It had been widely taught that the placenta acted as a barrier to protect the baby from harmful substances and that to damage a baby through poisoning without killing the mother too would be impossible.

We now know that nothing could be further from the truth. There are a number of substances which can damage a baby profoundly, particularly during the early weeks of pregnancy, probably even before the mother knows that she is pregnant. The most important of these are radiation, chemicals, notably drugs, and infections, particularly virus diseases of which German measles is the most notorious.

It is not yet known which drugs can damage a foetus though in animals almost any drug can. No drug is regarded as completely safe in human beings and to some extent giving any drug to a woman who might be pregnant is taking a risk. Yet despite the countless hazards and risks involved throughout the entire nine months of pregnancy, the miraculous fact remains that most babies survive them. Day and night, sleeping and waking, the mother's body will feed the foetus within her until, from internal organs to toe nails, from brain to fingers, from spinal cord to eyelids, he is complete and ready to face a brave new world. Naturally he will complain lustily when he has to leave his early safety.

The drugs people take

Against the ills and aches of daily life, and at the instant call of doctors and surgeons, a colourful and powerful world of modern drugs is ready for action

'IT'S good for what ails you,' was the spectacularly comprehensive advertising slogan for all varieties of 19th century patent medicines – potions, tonics, ointments, liniments, and pills. In the 1960's, no single form of drug or medical preparation promises to do anything so grandiose. In the United States alone, there are at least 7,000 kinds of medication which treat almost as many kinds of complaints – from headaches and upset stomachs, to coronaries and paralytic strokes. And these are available in 80,000 different colour combinations. Throughout the modern world, the pill business is booming.

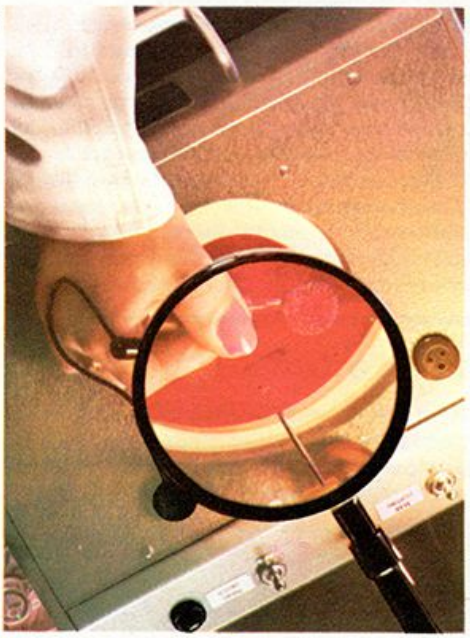
Around the turn of the twentieth century the techniques of chemistry, and in particular biochemistry, improved dramatically. A greater understanding of the mechanics of disease and infection opened the way for the breakthrough in synthetic – or man-made – drugs. The pharmaceutical industry, which now has an annual world turnover of more than 10,000 million pounds, is only forty years old. The 1966 estimated turnover in Britain of £283 million could be translated into the astonishing figure of nearly 14,000 million tablets a year, at an average price of 5.2 pence each.

The largest classes of compounds bought directly by the public are probably pain-killers, like aspirin, and expectorants and decongestants – cough medicines and cold 'cures'. But more potent drugs are used when the functioning of the body's vital organs breaks down or is somehow impaired. This is the way drugs go to work when a patient needs aid to breathe efficiently.

In the process of breathing, oxygen is inhaled, passed down the windpipe, and sent through the bronchioles to the tiny air sacs that make up the lungs. The blood stream carries the oxygen throughout the body and releases it to individual cells to be burnt as fuel. The cells give off the waste product carbon dioxide. This is dissolved in the blood liquid and circulated to the air sacs, the minute blood vessels or capillaries which encircle the bronchioles. Here the carbon dioxide in the capillaries is exchanged for fresh oxygen in the air sacs.

To effect this transfer of gases, the 'inspiration centre' and 'expiration centre' in the brain adjust the rate of breathing. Difficulty sometimes arises when the lung's air sacs become abnormally rigid, as in the case of emphysema, or the bronchial tubes abnormally constricted, as in the case of asthma, and the oxygen-carbon dioxide exchange is impaired. The drug aminophylline relaxes the involuntary muscles, expands the bronchial tubes and so facilitates breathing. Curare-type drugs produce paralysis of the respiratory muscles and temporarily stop breathing during lung surgery. Morphine may depress or slow down the brain centres which control respiration, so that an excess of carbon dioxide in the blood can be decreased, and the oxygen supply increased.

In nearly all countries, the supply of the more potent drugs is controlled, and they are only available from a chemist on production of a doctor's prescription. Of these 'prescription-only' classes the largest is the antibiotic market which accounts for about 17% of the total expenditure, followed by the tranquillizers with some 10%. This last figure means that in Britain alone seven hundred and ninety million tablets or capsules of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The culture of a cure starts with a very simple plant, the fungus. 1 The microbiologist selects part of a fungus in the ever-increasing search to find the most prolific sources of new drugs. 2 Fungi can be the colours of the rainbow. The dark green *Penicillium* colony yields the famous drug penicillin. 3 Thousands of tests, which may take many years, are performed before a drug can be prescribed by a doctor. Experiments on the best method of extraction come first. 4 Much later, drugs may be injected into eggs. The eggs are incubated, and the rate and details of the development of the chicks will yield vital information about any harmful or beneficial effects a drug might have.

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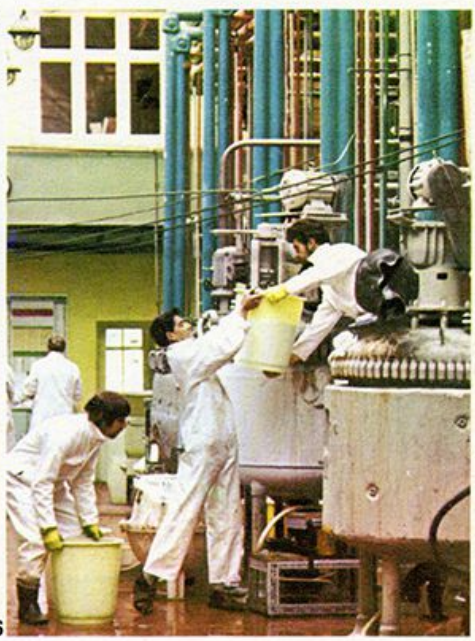

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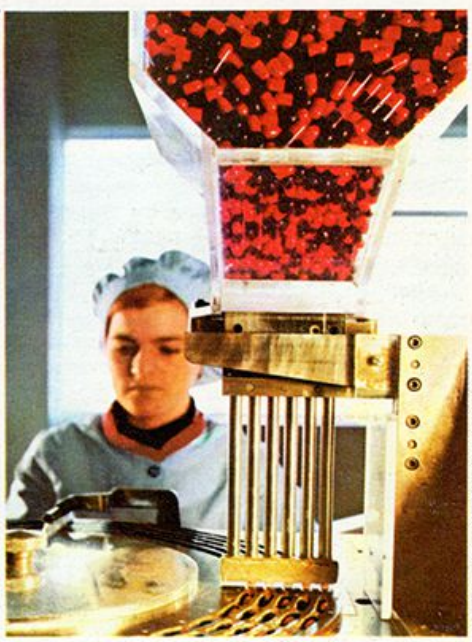

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By courtesy of Beecham Research Laboratories

5 Purity is at a premium in the making of antibiotics. During their manufacture, antibiotics are extracted from solution as crystals. The process is automatic, but any contamination might render the drug powerless. 6 When optimum yield is the priority, rougher treatment will suffice, but scrupulous cleanliness is still vital. For any new drug, limits on the quantity available may be a problem. 7 Capsules, invented in the 19th century, are made of gelatin. Once inside the body, the gelatin will dissolve, and the drugs inside released to do their work. Because every capsule must have the same properties, meticulous screening is carried out before drugs are released to the chemist.

By courtesy of Beecham Research Laboratories

The living factory: the cells of the fungus manufacture powerful drugs. But these drugs are elusive. The scientist may make extracts from 1,000 fungi before he finds one that produces a drug.

tranquillizers are taken every year – or about a fortnight's course for the whole of the working population each year. The proportion is higher still in Japan, which has the highest overall expenditure on drugs – and the highest expenditure per capita – in the world.

The method of medicine-taking throughout the world follows an obvious pattern. The richer countries spend more on drugs than poorer countries, and they also tend to use more of the newer and more sophisticated compounds. The higher doctor-patient ratio, and consequently the greater opportunity for the close supervision required in using more specific compounds is partly responsible for this. Partly, it is because patients in such countries have a higher degree of education and income and expect more from their doctors.

THE more industrialized and 'advanced' peoples receive the medicines their society requires – tranquillizers, anti-depressants, and drugs for heart conditions. These requirements are fulfilled and future ones anticipated by the pharmaceutical industry. At the present time the world's major pharmaceutical companies spend more than £200,000,000 a year on research on new products. Of this amount, companies in Britain contribute some £14.5 million, and the United States some £98 million.

This research covers all fields: 'molecular roulette' – the manipulation of the structure of known compounds to improve potency or eliminate unwanted side effects; the synthesis of new compounds based on the developing knowledge of biochemistry and pharmacology (the study of the action of drugs); and perhaps the most valuable, but the least commercially useful study, 'pure' basic research into micro-chemical and micro-biological processes.

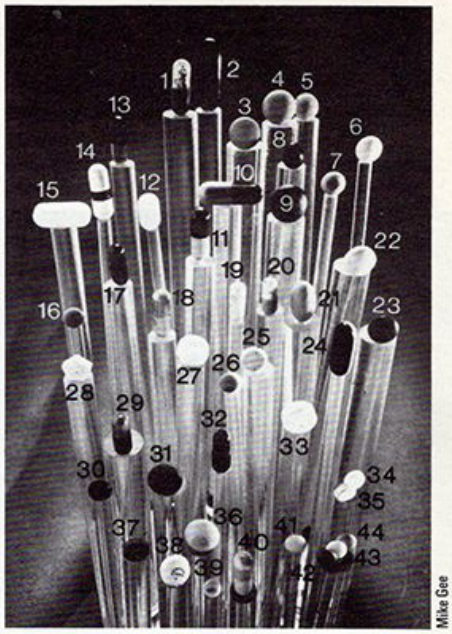
Research leads to the development of new drugs. And despite the meticulous checking, testing, and frequent rejection of new compounds, dangerous or even fatal drugs can be marketed. The reasons for this are three-fold. First of all, the majority of testing on the dangerous effects of a new compound is carried out on animals, not on human beings. Though most effects in man can be demonstrated in some breeds of animals, the effects are not always exactly comparable. What can certainly be shown in animal testing is that a compound is not a true 'poison' in the accepted sense of the word. Secondly, and this has become of increasing importance, medical knowledge cannot always keep pace with pharmaceutical innovation. So it was not recognized that a drug – such as thalidomide – with a valuable medicinal action could affect the development of an unborn baby. Thirdly, it is almost impossible to have a drug that is absolutely safe. The safety of a drug means that its properties are known and recognized, and that in a given situation its beneficial effects outweigh any possible harmful effects. It is justifiable, indeed it is the duty of a physician, to give a 'dangerous' drug when the chances of curing the patient greatly exceed the possibilities of producing a harmful side-effect.

SO the safety of a drug really implies, not that there are no possible unwanted effects – for if so, it would probably be inert and valueless, but that all its possible effects, beneficial and unwanted, are investigated, documented and published. It was to ensure that tests on new substances were properly carried out that bodies like the Food and Drug Administration in the United States and the Dunlop Committee in the United Kingdom were established.

Despite the comparative newness of drug manufacture, the search for remedies to cure, modify or improve the course of disease is not new. The use of drugs goes back to the dawn of history. In this sense 'Drug' is given the widest possible meaning – a substance which changes the behaviour of a living organism by some biochemical change. This definition therefore includes pure poisons such as cyanide, arsenic, strychnine or snake venom (which in proper doses can have useful medicinal effects), drugs of dependence such as opium and its derivatives (which are effective as painkillers and hypnotics), and purely medical or therapeutic substances like the antibiotics, aspirin, insulin, cough medicines and indigestion tablets of modern medicine.

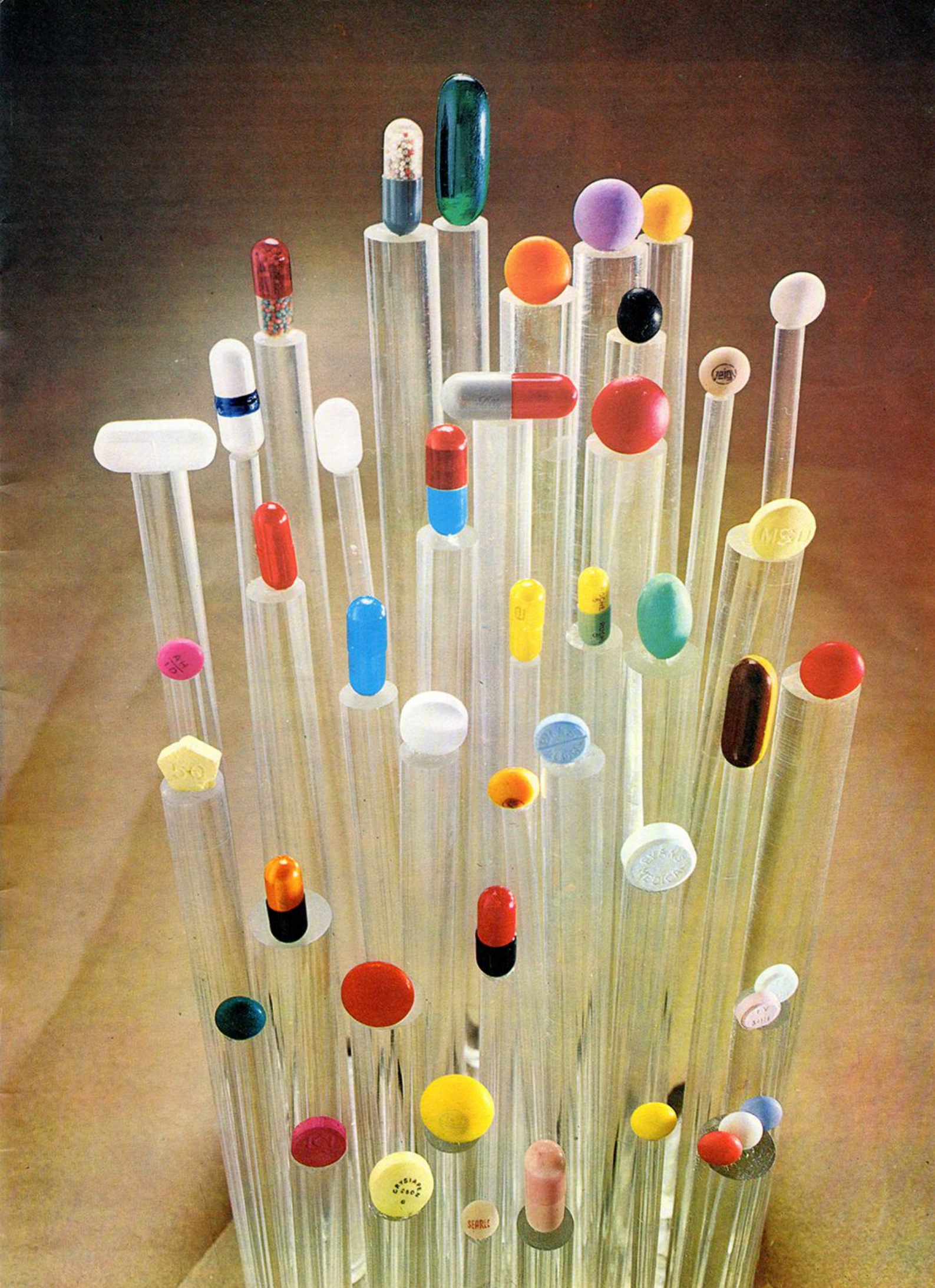
In their endeavour to understand and so to improve the human condition, the early practitioners of medicine – witches, alchemists and doctors – experimented with the use of vegetable substances and extracts, and studied their effects on the body. But only since the beginning of the 20th century have specific substances been produced with a pre-determined action upon a given infection or disease.

The first major breakthrough was the



Mike Gee

In 80,000 different colours, today's drugs cover the whole spectrum of medical knowledge. Some, like the vitamins, alleviate special symptoms, others, such as the barbiturates, have a more general use. The doctor's task of keeping abreast with advances in drug research is a difficult one. Unless he can rely completely on the truthfulness of drug producers, he could make a fatal mistake.
1 Antihistamine: treats hay fever, allergies and eczema.
2 Oestrogen: female sex hormone.
3, 31, 32, 36, 38, 40 Antibiotics: destroy infecting bacteria.
4, 5, 8 Vitamins: used to treat deficiency diseases like scurvy.
6 Laxative: relieves constipation.
7, 10, 12, 26 Analgesic: local anaesthetics. The best known is cocaine.
9, 13 Iron: treats anaemia. Helps the bloodstream carry more oxygen.
14, 17, 18, 19 Barbiturates: sedative and anaesthetic drugs. The best known is phenobarbitone.
15 Appetite depressant: used to help the obese reduce weight.
16 Anti-depressant: relieves symptoms of mental depression.
20 Tranquillizer: treats severe anxiety and agitation.
21 Diuretic: used in kidney disease.
22 Drug to lower high blood pressure.
23 Hormone: treats hormone deficiency.
24 Treats congestion of the respiratory system.
25 Anticoagulant: prevents clotting of the blood in the veins.
28 Urinary antibacterial: treats bacterial infections of the bladder.
29 Anti-asthmatic.
30 Treats allergies.
33 Controls over-acidity of the stomach.
34, 35, 41, 42, 43, 44 Contraceptives.
37 Drug for treating heart disease.


MSI
SEARLE

Remedies for everyday ailments are not new. A doctor could prepare cough mixture from a detailed recipe in the 13th century; more recent remedies have boasted powers to eliminate biliousness and indigestion. Yet today, despite intensive research, there is no drug that will cure cancer or the common cold.

Radio Times Hulton Picture Library

The Metropolitan Museum of Art/Rogers Fund 1913

discovery of the suphonamides in Germany in the early thirties – the first compounds capable of combating an infection in the body. They gave new hope to sufferers of diseases like pneumonia, and later, during the second World War, to those who would in other times have been fatally injured.

At first these compounds were dangerously toxic, and it was somewhat doubtful whether the infection or the patient would be killed first. But they were of immense value and gradually improved: their therapeutic effect was maximized and their toxic effect minimized. Later came the antibiotics, the first of which – penicillin – was discovered by Sir Alexander Fleming in 1928. The history of penicillin is one of a providential accident. Fleming, experimenting with cultures of bacteria accidentally let one of them become contaminated with the bluish-green fungus *Penicillium*. He observed that the bacteria near the site of the contamination died, and after further tests was forced to the conclusion that the fungus contained a bactericidal chemical. The mould did not yield penicillin easily, and Fleming reluctantly abandoned his work on the drug. But Howard Florey and Ernest Chain, in laboratories in Oxford, took over the project with notable success. Had it not been for them, the significance of Fleming's discovery would never have been realized.

BY 1940 they had accumulated enough of the drug to treat five patients for blood poisoning. Today, antibiotics are produced synthetically, but like their predecessors they have helped to combat virulent killers, in particular tuberculosis, typhoid and venereal disease.

In 1958 the first drug to be really beneficial in the treatment of mental illness – chlorpromazine – was put on the market. It assisted in the transformation of the padded cell 'lunatic asylum', into the contemporary hospital for the mentally ill, where treatment is directed towards rehabilitation and cure rather than physical restraint.

One of the most important, and certainly the most publicized, discoveries of pharmaceutical research has been the effective oral contraceptive, known simply as 'the pill'. It was first made in the laboratory in 1952, put on extensive clinical trials in 1956, and released for sale as a means of fertility control by the United States Food and Drug Administration in 1960. Since its introduction, many new formulations containing different proportions of the two essential hormone constituents have been put on the market.

For the future, only time can tell. As the mechanisms of disease, growth, ageing and repair become more fully understood the possibility of modifying these processes become more probable. At present, there are drugs capable of halting or reversing the growth of some forms of cancer, but so far their actions are too dangerous and unpredictable for general use. They will certainly be modified, and new and hopefully more successful approaches made.

Finally, it must be asked, what is the value of drugs? Do they really work, or is it all magic, more sophisticated and more scientific – but still magic? Would a placebo or inert pill, taken with faith, work as well? The answer to this, like the answer to so many questions in medicine, is imprecise. All active drugs have an effect on living organisms. Some drugs, like the antibiotics which destroy bacteria, the hypnotics which induce sleep, and the oral contraceptive which modifies the reproductive cycle, have demonstrable effects and so can be proved to work. But a great area of medicine is concerned with simply relieving the symptoms of disease and assisting the body's own natural defences. In that area it is difficult to determine the effectiveness of any treatment. The tranquillizing drugs have a definite measurable effect, but in a condition as subjective as anxiety or tension any tablet or even any understanding listener may have as beneficial a result.

Much of our knowledge is limited, but some things are certain – no placebo will substitute for insulin to a diabetic.

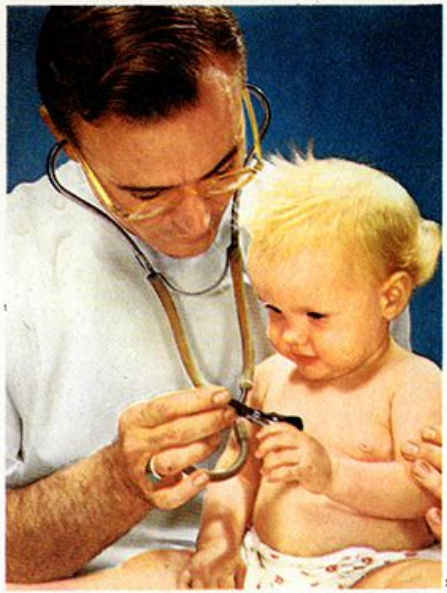
requires the use of both sight and hearing – for instance, television, as compared with radio (ear only) or the printed word (eye only). In education, audiovisual aids such as closed-circuit television are used for more rapid teaching than would be possible by lectures alone or by reading.

AUDITORY means relating to hearing, or to the organs of hearing. The **auditory canal** carries sound waves from the outer ear to the eardrum (see **ear**). The **auditory nerve** transmits the signals from the eardrum via the bones of the inner ear to the brain. A part of this nerve is also concerned with balance, and when damaged can cause giddiness.

AURA is most commonly used in medicine to describe the peculiar warning symptoms of an attack of migraine (see **migraine**) or epilepsy (see **epilepsy**). These warnings may be visual (wavy lines or a bright light), acoustic (a noise such as 'ringing bells') or olfactory (a sensation of a smell not necessarily connected with one's immediate surroundings). The Latin word *aura* means a breeze, odour or gleam of light.

AURIS is the medical name for the ear (see **ear**). **Auricle** is the lobe of the ear, but is also applied to the appendages of the upper chambers of the heart (see **heart**) because they bear a rough likeness to ears. An **auriscope** is an instrument, sometimes incorporating a light, for examining the ear. An **aurist** is an otologist, a specialist in diseases of the ear. **Auristillae** are eardrops. *Auris* is the Latin word for ear.

AUSCULTATION is listening to the sounds made by internal organs, such as the heart, lungs and intestines, through the chest or abdominal wall. Usually this is helped through the use of a stethoscope (see **stethoscope**), although the noises can be heard by the direct application of one's ear. Auscultation has a wide variety of uses, ranging from the detection of heart and lung disease to the monitoring of the baby's heartbeat in the womb during pregnancy and labour.



Keystone

Auscultation helps determine whether this child's heart is developing normally. The doctor is using a stethoscope.

School for Autistic Children Ealing

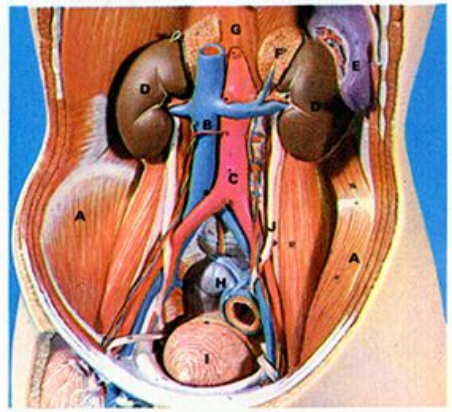
Picture games help these autistic children develop rational thinking patterns, instead of being lost in their own world.

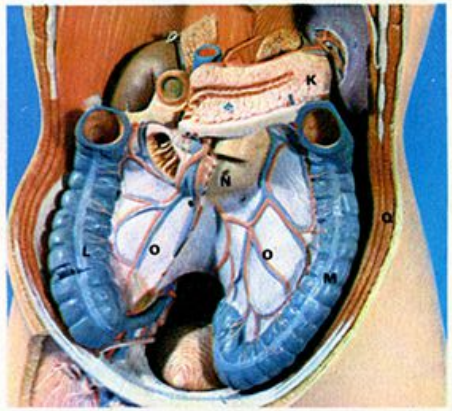
AUTISM means the state of being withdrawn from other people. **Autism of early childhood** is a condition affecting 4 in 10,000 children which begins from birth or within the first $2\frac{1}{2}$ years of life.

ABDOMEN is the part of the body which is bounded above by the diaphragm, separating the abdomen from the thorax (see **diaphragm, thorax**) and below by the floor of the pelvis (see **pelvis**). In front it is covered by the abdominal musculature, and behind it is bounded by the lumbar and spinal muscles. It contains the organs of digestion (stomach, intestines, pancreas and gall bladder), the organs of excretion (kidneys, ureters and urinary bladder), the organs of reproduction in women (ovaries, Fallopian tubes, uterus and vagina), certain other organs such as the liver, spleen and prostate, together with the arteries, veins, lymphatics and nerves supplying all these organs.

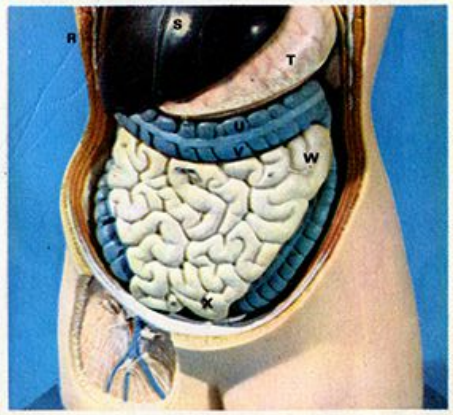
Like other parts of the body, the abdominal organs are subject to diseases and injuries. These include perforations, inflammations, obstructions and new growths. Many abdominal diseases are a combination of more than one of these. Cancer of the bowel, for example, is a form of new growth which may cause an obstruction.

New growths in the abdomen may be benign or malignant (i.e., cancerous). Colic occurs when any of the tubes within the abdomen tries to remove an obstacle by pushing it further along. Colic can be caused by a stone in the duct (tube) leading from the gall bladder, or a stone in the ureter (the tube from the kidney to the urinary bladder), or when there is any kind of temporary hold-up in the bowel (such as an attack of 'wind'). Perforations may be due to external injury (from car accidents, for example); or to the swallowing of sharp indigestible fragments such as





Main organs of the abdomen shown in this model are: a, the levator ani (muscle). b, the inferior vena cava (vein). c, the abdominal aorta (artery). d, the kidneys. e, the spleen. f, the suprarenal gland. g, the oesophagus. h, the rectum. i, the urinary bladder. j, the ureter. k, the pancreas. l, the ascending colon. m, the descending colon. n, the duodenum. o, branches of the superior mesenteric artery. p, interior of the duodenum. q, abdominal musculature. r, the liver, right lobe. s, the liver, left lobe. t, the stomach. u, the large intestine. v, the transverse colon. w, the jejunum. x, the ileum.



Somso Biological Works Models/Adam Rouilly & Co. Ltd.

bones; or to the rupture of an ulcerated stomach or intestinal wall.

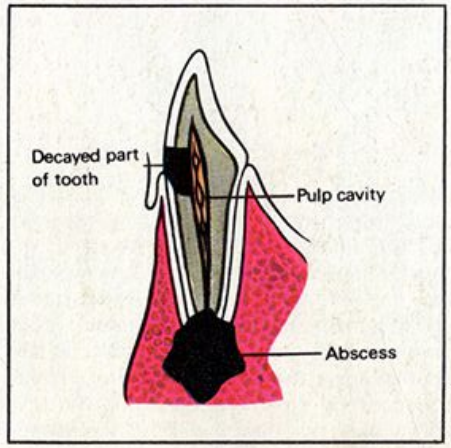
ABLATION is a detachment or removal. Examples are the premature separation of the placenta or afterbirth (see **afterbirth**); and detachment of the retina (see **retina**), the back of the eye where the 'picture' of the outside world is formed.

ABORTION (also see **miscarriage**) is the miscarriage of the product of conception before the foetus (child) is viable, i.e., capable of separate existence. An **abortifacient** is a drug or instrument which can be used to produce a miscarriage. **Criminal abortion** is the use of any method to produce an illegal miscarriage. Nations differ in their laws covering the legality of abortion. In Britain for example, the Abortion Act, 1967, made legal the abortion of a woman, carried out in good faith to save the life or health (including mental health) of the mother; or in the case of a substantial risk of a malformed foetus; or to preserve the continued good health of any existing children. Such abortions must be carried out in institutions recognized for the purpose by the Secretary of State for Social Services, and must be notified to his department. The recommendation of two doctors is also required.

ABRASIONS are areas denuded of skin or mucous membrane. Minor external abrasions may be treated by washing the injured part with soap and water and the application of a covering, such as a plaster. Internal, and serious external abrasions need medical attention. In dentistry, abrasion means the mechanical wearing down of teeth.

ABREACTION, in psychiatry, is the process of freeing from the mind emotionally-charged but repressed material. It is used in cases where an experience, probably unpleasant, is lost from the conscious memory but remains in vivid form in the subconscious, causing hysteria, anxiety or amnesia for which there is no apparent reason. Abreaction is a process of bringing these memories into the open – by hypnosis, by drugs such as L.S.D. or by 'free association' discussions with a psychiatrist – and, by discovering the cause of the condition, eliminating it.

ABSCESS means a localized collection of pus (see **pus**) in any part of the body, an example being a boil (see **boil**). Pus is formed when the blood supplies white corpuscles to defend the body against an 'invader', so that an abscess – a collection of dead corpuscles – forms on the battlefield between the invader (be it a bacterium or a bullet) and the body's defences. If the abscess is acute, or hot, it shows that the battle is continuing. In cases of external abscess, poulticing with hot fomentations may bring the abscess to a head and it may burst on its own or subside. It may need help by lancing, but for this medical advice should be sought. In certain parts of the body the abscess may become chronic (i.e. smouldering) or cold where the cavity filled with pus, after the battle is over, fails to clear. In thus occupying space, it presses on other organs and needs surgical intervention to help it drain or heal.



An abscess at the base of a tooth, caused by decay exposing the sensitive central pulp cavity, is a common cause of toothache. Rinsing with bicarbonate of soda may bring temporary relief.

ATRIUM means a cavity, entrance or passage. It is used anatomically to describe the two upper chambers of the heart where the blood from the veins collects (see **auricle**). Sometimes in heart disease the atrium beats out of phase with the part of the heart pushing out the blood to the body (see **ventricle**). Depending on the nature of the abnormal rhythm, the heart is then said to be fibrillating or fluttering.

ATROPHY is used in medicine to mean a reduction in the size of an organ or cell which has been, or which is, in disuse. It can also be used of the wasting of organs or muscles and of degeneration. Examples are: **Progressive muscular atrophy**, an uncommon chronic disorder of the nervous system which results in wasting of the limb muscles. **Atrophy of the liver,** a cellular degeneration; it occurs, for instance, where the cells actually degenerate, in cases of acute poisoning by substances (such as cleaning fluids) which are inadvertently swallowed.

ATROPINE – see **BELLADONNA**

A.T.S. is the common abbreviation for anti-tetanic serum. Until recent years this serum, which contains antibodies, called antitoxins, against tetanus, was given routinely as a protection for wounds and abrasions which might have come into contact with infected soil. It confers a 'passive immunity' (see **immunity**) – that is, one that is not produced by the patient's own body. However, it also tends to cause side effects (see **side effects**). Now, the usual procedure is to try to make the body produce its own antibodies by stimulating it with a vaccine (tetanus toxoid) thus producing 'active' immunity.

ATTAR is a general name for any of the volatile oils. **Attar of roses** is used in lotions and mixtures to make them smell and taste better.

ATTENUATION means a thinning, weakening or diluting. In medicine it is used especially to describe the reduction of the virulence of a virus or other micro-organism. This may be achieved by the continuous culture of several generations of the organism in the laboratory; the repeated inoculation of a culture through animals (this is referred to as *passage*); exposure to excessive light, heat or air; or the introduction of a weakening agent into the culture where it grows. Attenuated organisms are important because they will produce the same antibodies in the human body as will the more virulent organism; thus they can be used for vaccines.

ATTIC is the name for part of the middle ear, a cavity above the main chamber. Sometimes an infection in the attic will perforate the eardrum – an **attic perforation**.

ATTITUDE, in medicine, is the term used to describe the posture, or the position of the body and limbs; for example, the position of the foetus in the womb and how it is lying.

ATYPICAL means not typical, or irregular. One condition it is used to describe is a form of pneumonia, **primary atypical pneumonia**, due either to a virus infection or to another organism known as 'Eaton agent' and presenting symptoms different from the 'classical' attack.

AUDIBILITY means ability to be heard. Human beings can detect sound waves only of certain frequencies. The lowest frequency, or pitch, that the human ear can detect is approximately 30 vibrations per second (corresponding to a very deep vibrating rumble). The highest is in the region of 30,000 vibrations per second (corresponding to a piercingly shrill sound). Some animals can hear sounds outside the human range.

AUDIOMETERS are instruments for measuring the acuity (see **acuity**) and range of hearing. An **audiogram** is a record, in graph form, of the variations in the acuity of hearing of an individual as shown by the audiometer.

AUDIOVISUAL means relating to the ear and eye. It is used of apparatus which